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**Closed Timelike Curves: Gödel's Solution for Einstein's Field Equations in the General Theory of Relativity and Bach's *The Musical Offering* as Configuration Models for Narrative Identity Constructions in Richard Powers's *The Time of Our Singing***

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New York, spring 1949. David Strom, a German-Jewish physicist at Columbia University, is on his way to the Metropolitan Museum of Art. This Sunday field trip is an initiation rite that David celebrates in honor of his sons, Jonah and Joseph. Strom, whose chief occupation is to give lectures on Einstein's theory of relativity, explains to his sons that the conception of time as linearly organized is obsolete. Furthermore he explains that the term "now" cannot be defined by two observers from two different frames of reference simultaneously, because it is not time which is a constant point of reference, but the speed of light. The relativity of simultaneity is too hard to grasp for the children. Nevertheless, Joseph asks: if everyone understands something different under "now", how are we able to make appointments? Is the Newtonian concept of time not necessary as social convention? This ability to question conventions as normative grounds cannot be rehearsed too early on. The boys will need it in relation to the social projections they will be subjected to. This already announces the second aporia of the novel: Jonah and Joseph do not find it easy to identify with the cultural communities that surround them, as their father is a German Jew and their mother, Delia Daley, is African-American. Their marriage, legally performed in New York in 1941, constitutes a felony in three quarters of the remaining states. The acceptance of the African-American and white communities towards those members who in terms of their heritage represent a joint project is not to be taken for granted. That is the dilemma with which the sons are confronted: they belong to both the white and the black communities and thus subvert the legitimacy of demarcations that function as mechanisms of identity formation. Their mother and father dared to cross that line and their marriage ended in Delia's death and David's tragic isolation. Does the spiritual strength of their love nonetheless have the power to open up new ways of thinking for a future in which such a union would be recognized? Can art function as mediation in this matter?

The museum scene ends in a concert, a *cantus firmus*, a new initiation experience that leaves Joseph and Jonah deeply impressed. The scene in the museum introduces the three main themes of the novel that will be at the forefront of this essay: firstly, the aporia of time in physics, secondly, the aporia of identity with regards to the hybrid background of the sons, and thirdly, music. I would like to show how the problematics of identity, situated on a field of tension between continuity and change, are exposed in a narrative structure that builds on the principles of physics and on the artistic constructions of music. Both contexts are embedded in the biographies of David and Delia, shape the narrative form of the novel, and show similarities between each other. With respect to music, the basic procedures of the fugue and the canon that are employed in J. S. Bach's contrapuntal compositions in general as well as in *The Musical Offering* specifically—augmentation, diminution, inversion, and crab canon—are cited in the novel. Regarding the physics, it is mainly Kurt Gödel's model of *Closed Timelike Curves* as cosmological solution to Einstein's field equations in the theory of relativity, as well as the principles of time dilation and space contraction that function as references.<sup>1</sup> The similarities between music and physics are to be understood solely on the level of narrative technique.

This idea arguably found its inception in Douglas Hofstadter's Pulitzer Prize-winning book, "Gödel, Escher, Bach,"<sup>2</sup> which also served as a pretext to Richard Powers's "The Gold Bug Variations."<sup>3</sup> In his text, Hofstadter describes analogies as information-bearing isomorphisms between the mechanisms of music and those of formal logic. Indeed, prior research has already indicated the importance of the physical conceptions of time for the temporal structure of the novel: John Dewey limits the concept of time that David is working on to quantum theory.<sup>4</sup> The problem of *Closed Timelike Curves*, as is to be shown, however, is a consequence of the general theory of relativity. Heinz Ickstadt refers to Einstein's legacy and interprets the polytemporal structure of the novel as a possibility for the simultaneous realization of the past and the future which anticipates the prospect of a peaceful formation of

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<sup>1</sup> This essay would not have existed in this form without the inspiring conversations with friends and colleagues. I owe Antje Kley, who in October 2010 organized a conference in Erlangen on Richard Powers, the initial incentive to engage with Powers's work. I would like to thank Klaus Mecke for the inspiring conversations on the science historical context of Kurt Gödel's theory, and Christine Lubkoll for suggesting René Girard's theory of sacrifice. My thanks also go to Jasper Verlinden for the translation into English.

<sup>2</sup> Cf. Douglas R. Hofstadter, *Gödel, Escher, Bach: An Eternal Golden Braid*. New York, 1979.

<sup>3</sup> Cf. Barry Lewis, "Thirty Two Short Paragraphs about The Gold Bug Variations." *Intersections*. Ed. Stephen J. Burn. Chicago 2008. 45-66.

<sup>4</sup> Joseph Dewey, "Little Knots, Tied in the Clothing of time, The Time of our Singing as a Dual Time Narrative." In: Stephen J. Burn, ed. *Intersections: Essays on Richard Powers*, 2008. 198-214.

a hybrid community.<sup>5</sup> Yulia Kozyrakis brings the recursive pattern of themes, scenes, and tropes in the novel back to the form of the rondo. The physical background of the recursive temporal narrative concept of the novel, however, is not considered in this reading.<sup>6</sup> Meike Reher locates the technique of counterpoint in the novel and points towards the narratives of the sons and those of the parents as contrapuntally interweaved themes.<sup>7</sup> Neither Gödel's cosmological model nor Bach's *The Musical Offering* have as of yet been identified as structural templates for the text. My analysis builds on the findings of previous research and additionally asserts that both the physical and the musical model, as information-bearing isomorphisms, shape the narrative structure of the novel. The goal is to show how the narrative configuration of the novel, inspired by both music and physics, gives rise to identity-constructing elements for the yet to be developed hybrid community. The analytical foils, which serve as a background for the analysis of the aporia of identity formation, are Paul Ricoeur's concept of the narrative identity<sup>8</sup> of oneself as another<sup>9</sup> and René Girard's studies on mimetic desire.<sup>10</sup>

David Strom functions as a representative for the physics, and for the music, it is Delia Strom who sacrificed her own career in order to dedicate herself to the musical education of her children. She herself does not see it as a sacrifice, but rather as a gift. This already announces the ambivalence of the sacrificial theme as offering or victim and alludes to those musical templates whose principles of composition work as a structural model for the narrative configuration of the novel: J. S. Bach's *The Musical Offering*. Bach wrote this quodlibet, a collection of counterpoint phrases, on the occasion of his visit to Frederick II, who presented the composer with the challenge of a complex theme. In its entirety, the work is comprised of two fugues, ten canons, and one sonata, all variations on the royal *thema regium*.<sup>11</sup>

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<sup>5</sup> Heinz Ickstadt, "Surviving the Particular? Uni(versali)ty and Multiplicity in the Novels of Richard Powers." *European Journal of American Studies* 1 (2007): 1-13. 8-11. Cf. also Heinz Ickstadt, "Asynchronous messaging: the Multiple Functions of Richard Powers's fictions." In: *Ideas of Order: Narrative Patterns in the Novels of Richard Powers*. Eds. Antje Kley and Jan D. Kucharzweski. Würzburg 2012, 23-44.

<sup>6</sup> Yulia Kozyrakis, "Sightless Sound: Music and Racial Self-fashioning in Richard Powers's *The Time of Our Singing*." In: Kley 2012, 175-194.

<sup>7</sup> Meike Reher, *Die Darstellung von Musik im zeitgenössischen englischen und amerikanischen Bildungsroman*. Frankfurt am Main 2010. 262-286.

<sup>8</sup> Paul Ricoeur, *Time and Narrative, Vol. 3*. Chicago 1988. 244-274.

<sup>9</sup> Paul Ricoeur, *Oneself as Another*. Chicago 1992. 113-168.

<sup>10</sup> René Girard, *Violence and the Sacred*. New York 2005.

<sup>11</sup> On the structure and composition of *The Musical Offering*, see Christian Wolff, ed. *Johann Sebastian Bach, Kanons, Musikalisches Opfer BWV 1071-1079. Neue Bach-Ausgabe, series VIII, vol. 1, Kritischer Bericht / Critical Commentary*. Kassel 1976.

The double dilemma, the one of time and the one of identity, consolidates in the two main themes of the novel, which, as in a musical composition, are established first as exposition and then as variations in a variety of voices and narrative arrangements. In fact, the first four chapters correspond with the structural model of a Bachian fugue: typical for the beginning of a fugue is that the voices do not enter simultaneously, but successively. Two elements play a specific role here: the theme (subject) and the counter theme (countersubject or counterpoint). The leading voice sounds the theme in the tonic key. Then the accompanying voice answers by offering the theme in the dominant. Finally, an additional voice appears with the counter theme or countersubject.<sup>12</sup> Once the theme has appeared in all the voices, we can speak of a first development, the exposition. The main theme of the novel is already contained in the opening scene: John Dowland's "Time Stands Still" sung by Jonah on the occasion of the *America's Next Voice* singing competition. In the novel, this theme has the function of a *cantus firmus*, a central melody that forms the basis for a polyphonic counterpoint composition. In addition to the thematics of time, that of identity is treated in the expository chapter as well, as the decisive question posed to the sons after the concert is: "What exactly are you boys?"<sup>13</sup> (TS 6). Joseph, the homodiegetic narrator, comments: "The question we grew up on. The question no Strom ever figured out how to read, let alone answer" (TS 6). The difficulty of this identity question is expressed in Jonah's ambivalent response. The song that Jonah then cites: the beginning of Schubert's *Winterreise*, "*Fremd bin ich eingezogen*" (i.e., "As a stranger I arrived") (TS 6), only sketches out a preliminary attempt at answering the question posed by the novel as a whole. And at the same time, it mirrors the inclusion/exclusion dilemma that the children are surrendered to.

The second chapter, which forms the second part of the exposition, introduces the theme of time stasis from the perspective of relativity theory. This way, the father offers, as countersubject to the leading voice, a variation of the main theme in a physical sense: he is working on a solution to Einstein's field equations in the general theory of relativity provided by the mathematician Kurt Gödel. It concerns a cosmological solution whereby the universe is rotating and containing *Closed Timelike Curves*.<sup>14</sup> In Gödel's universe, linear time flow and the absolutely sequential order of past, present, and future are obsolete. Time stands still.

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<sup>12</sup> A clear formal definition of the fugue is hard to give. The definition offered here is derived from the prototype of Bach's fugal creations. Cf. Emil Platen, "Fuge." In: *Die Musik in Geschichte und Gegenwart*. Sachteil, Bd. 3. 930-958. 931.

<sup>13</sup> Richard Powers, *The Time of Our Singing*. London 2004, 6. Further citations from the novel will be offered in the text.

<sup>14</sup> Kurt Gödel, "An Example of a New Type of Cosmological Solutions of Einstein's Field Equations of Gravitation." *Review of Modern Physics* 21.3 (1949): 447-450.

Furthermore, the second chapter also contains the counter theme of identity, offered in the dominant by the voice of the countersubject, the mother Delia. She is introduced in context of the family's regular evening activity of improvising riddle canons. The mother provides the theme, the father has one measure to respond with an appropriate counterpoint that courts and modifies the theme, whereupon the children continue the variations with their own ideas. The only rule in this family game of canons is that, every voice expresses the dilemma of the family as a whole, i.e., the lack of acceptance from their communities of origin: "But where will they build their nest?" (TS 11). If we compare the opening arrangement of the novel with the exposition of a fugue, we recognize structural parallels: the first chapter is dominated by the voices of the brothers, the second by the father as countersubject to the leading voice and by the mother as countersubject varying the counter theme of identity. This is followed by a "free voice" passage titled, "My Brother's Face," and lastly, the coming together of point and counterpoint in the interlude.

Both themes are tightly conducted towards a narrative event that functions as an initiation experience for the founding of the Strom family: Marian Anderson's art song concert, Easter 1939, which had to be held in front of the Abraham Lincoln Memorial in Washington, because, as an African American, she was excluded from performing on stage. The concert drew an audience of 75,000 and counts as one of the key events in the African-American civil rights movement. Delia and David both attend the concert. Their love of music seals their union and encourages them to enter into marriage.

At the same time, the exposition also fills a narrative purpose, because this is where the stage is set for the narrative development. The story of the Strom family is told in twofold strands, each with its own temporal structure. His own story and that of his brother are prospectively told by Joseph as homodiegetic narrator. The story of the parents oscillates between retrospective heterodiegetic narration and time loops. The retrospective narration can be found in the story of the mother, which begins with the decisive event of her death in a domestic fire and goes backwards towards her childhood. The recurring time loops, however, find their point of departure in the spacetime of Marian Anderson's art song concert. Six times, the storyline returns in time loops to these events: to the concert as the foundation of the marriage, to the death of the mother as its brutal end. At the same time, love and death are condensed into the contrapuntal theme of the countersubject in the dilemma of community identity: "The bird and fish can fall in love. But where will they build their nest?" In contrast to the *cantus firmus*, the counter theme does not immediately appear in full when first mentioned in the narrative. In the second chapter of the exposition, only the second part of the

Jewish proverb finds a voice, in the representation of the musical riddle canons. The circle only closes as the first part of the counter theme appears thirteen chapters later at the mother's funeral: as the theme of a quodlibet that the father performs in remembrance of the family's evening ritual. Joseph's narrative voice describes his father's piece as "our musical offering" (TS 144).

Not only the structure, but also the title of *The Musical Offering* is used in the novel to thematize its central problematic: the construction of identity in a new society which unites African and white Americans. As an adult, Ruth, Joseph and Jonah's sister, investigates the circumstances of her mother's death. Her research points towards a lynching, but this hypothesis is never confirmed. What does become clear is that the authorities prematurely ended their investigations because the victim was black. The responses from both communities to David and Delia's marriage show that the novel is not only implicating the white community in this potential lynching, from whose perspective, Delia, as David's companion in the public sphere, is only visible as a nanny at best. The people from Delia's immediate environment, too, respond to her transgression with isolation and expulsion.

These societal responses correspond with René Girard's cultural theoretical findings in *Violence and the Sacred*. According to him, it is a deeply embedded idea in the traditional mentality of a society that a violentless order can only be guaranteed by maintaining clear hierarchical differences.<sup>15</sup> Delia and David commit the "crime" of ignoring these differences and effecting a loss of differentiation. Both communities thus feel threatened in their self-conception—constituted through differentiation—and in their sense of security. The instinctive consequence is an arbitrary outbreak of violence. The one guilty of the offense, i.e., the one causing the loss of differentiation, will be cast out of the community. This sacrifice sets an example meant to discourage any repetition of the offense. Through the death of the sacrifice, a fundamental difference is introduced that restabilizes the system. Whether Delia's death is a result of this mechanism is left open in the text. That society punishes her for her venture, however, is made apparent through her expulsion which is never retracted. According to Girard though, the death of the sacrifice also paradoxically leads to a retroactive glorification of the victim, because it guarantees the stability of the order. In the novel, the image of the mother is not only deified, but also her legacy, namely music, is functionalized.

#### **"Time Stands Still" – the common theme of music, physics and narrative identity**

To demonstrate the difficulties of identity formation in a new community of whites and blacks, the author undergirds the novel with a narrative model in which the legacy of the

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<sup>15</sup> René Girard, *Violence and the Sacred*, 106.

mother, i.e., music, and the legacy of the father, i.e., physics, embellish each other contrapuntally and sound out in harmony. In order to weave together the four disparate fields—music, physics, identity, and narration—they are underscored with a common denominator: time. The connections between time, physics, music, identity, and narration are illustrated through the main musical theme: John Dowland’s “Time Stands Still.”

Time stands still with gazing on her face,  
Stand still and gaze for minutes, hours, and years to her give place.  
All other things shall change, but she remains the same,  
Till heavens changed have their course and time hath lost his name. (TS 3)

In *The Musicalization of Fiction*,<sup>16</sup> Werner Wolf differentiates between the formal organizations of the concept of the “theme” in music and literature. He finds the difference to lie in the fact that the musical theme, as recognizable sequences of notes, recurs partly unaltered and partly strongly varied, and is thus established on the level of the signifier. The theme of a literary work, however, does not operate as a sequence of symbols, but as an abstract mental concept that performs its integrative function on the level of the signified. The medium of literature cannot tolerate as many recurrences of signifiers that are felt to be redundant.<sup>17</sup> Powers’s novel combines both. Just as Frederick the Great’s *thema regium* in *The Musical Offering*, “Time Stands Still,” the main musical theme of the novel, is repeated thirteen times throughout the text.<sup>18</sup> In terms of its content, the song reflects all the aporias that are conceptually problematized in the novel. Furthermore, it autopoetologically thematizes its aesthetic and conceptual problems.

Already in the first line of the first stanza, the main theme of the novel appears: the standstill of time. It is an aporetic problem within physics, a problem whose mathematical solution postulates a universe which will open up new possibilities of thinking, e.g., time travel. Secondly, the first line represents the meta-aesthetic reflection of the narrative concept: how can a narrative identity as expression of temporality be constituted in a fictional universe in which time stands still?

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<sup>16</sup> Werner Wolf, *The Musicalization of Fiction: A Study in the Theory and History of Intermediality*. Amsterdam 1999. I am basing my analysis on Werner Wolf’s intermedial theoretical approach, because it is located at the intersection between music theory and narratology, and because it is the latter that also offers a methodical approach that allows for the elucidation of the physical-literary practice.

<sup>17</sup> Werner Wolf, *The Musicalization of Fiction*, 19.

<sup>18</sup> Barry Lewis has shown that in Powers’s novel *The Gold Bug Variations*, which is based on Bach’s *Goldberg Variations*, there are also structural parallels to be found between the recurrence of the musical theme in Bach and the literary theme variations in the narrative. See Barry Lewis, “Vertical Perfection, Horizontal Inevitability in Richard Powers’s *The Gold Bug Variations*.” In Kley 2012, 45-66. 50.

The second line of the song works as a reflection on the thematic-conceptual problem of the novel: how can the beloved departed mother be offered a memorial? How can an artwork be created that evokes the bitter price of exclusion that Delia had to pay for her courage? The line meta-aesthetically reflects on how the legacy of the mother, i.e., music, can shape the aesthetic organization of a literary text that makes visible the thought prohibitions of the society which contributed to Delia's tragic fate. In the third line, the central idea of the narrative conception of identity—which will be analyzed with Ricoeur's theory—is finally concentrated *in nuce*: “All other things shall change, but she remains the same.” It is the paradox of permanence within change, the idea that identity exists in continuation, both due and in spite of dynamic change. The question the novel asks, both in terms of content and aesthetic organization, is: How can the perilous project of building a new society be made plausible not as an abrupt change, but as a continuous transition that could gradually find social acceptance? With which methods can a work of art be created, so that its aesthetic foundation can make permanence **and** continuous transformation simultaneously conceivable? The fourth line of the song contains the perilous quintessence of the narrative experiment and names the price that has to be paid. This line, “Till heavens changed have their course and time hath lost his name,” identifies the risk involved: Time, the fundamental *a priori* which undergirds the thinking of any cosmological order, will lose its intuitively understood essence. It will change to make room for the perpetuation of the fundamentally transient, for the appreciation of a human life, for the glorification of a human sacrifice, for its aesthetic sanctification.

In its aesthetic design, the novel offers impressive answers to all these questions. The analysis of the main musical theme has shown that time constitutes the foundation for all the other central themes of the novel. Music, physics, and identity are narratively represented primarily in their temporal dimension.

The aporias of the measurement of time were already considered by Augustine, as Ricoeur's *Time and Narrative* indicates with the example of the enactment of a melody.<sup>19</sup> Through this melody, it becomes clear that it is impossible to perceive the “now”: In that moment in which it is spoken, it has already passed. In order to solve this dilemma, Augustine suggests the concept of a threefold present: the present of the past as memory, the present of the present as duration, the present of the future as expectation. Hereby, a psychological concept of time is introduced that is hard to reconcile with the cosmological one. This is why Ricoeur connects the Augustinian aporia of time with his Aristotelian theory of emplotment

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<sup>19</sup> Paul Ricoeur, *Time and Narrative*, Vol. 1. Chicago 1984. 7-16.



(*mise en intrigue*). His examination extends to the problem of narrative identity, which is intended to give evidence on how narrative emplotment bridges the aporia of the incompatibility of psychological and cosmological time through an interweaving of references between history and fiction.

### **Gödel's Closed Timelike Curves: The Cosmological Model**

Powers's novel proposes an analogous concept which is obtained from the general theory of relativity: the concept of *Closed Timelike Curves*. They constitute a mathematical solution to Einstein's field equations, but their effect is the same. Gödel's cosmological concept of time is no longer compatible with the intuitive, human concept of time. This is why in the novel, it is equated with a process that is already familiar to human perception, that of the *canon perpetuum* in music. To discuss the physical implications of this cosmological model, I will permit myself a brief excursion into theoretical physics. Joseph organizes his father David's legacy and gives his notes to a colleague for review. This colleague reveals to Joseph that his father's research in the significance of the time loops in Gödel's universe had been valid.<sup>20</sup>

In the general theory of relativity, space and time are no longer separate. The dimension of time joins the three dimensions of space and thus becomes a four-dimensional space-time continuum. This spacetime is determined by a four-dimensional multiplicity  $M$  of events and a metric  $g$  defined thereon. The central equations of the general theory of relativity are Einstein's field equations. They determine the relationship between spacetime geometry and the distribution of mass and energy in the universe:  $G_{\mu\nu}[g_{\mu\nu}] = 8\pi T_{\mu\nu}$ , in which  $G_{\mu\nu}$  is the Einstein tensor, and  $T_{\mu\nu}$  the momentum-energy tensor. The Einstein tensor indicates the information about the spacetime geometry. The momentum-energy tensor describes the density distribution of matter and energy in the universe. The right and the left side of the equation are in constant interaction: the spacetime geometry determines how matter and energy have to move. The distribution of mass and energy, for their part, influence the geometry of spacetime. Every solution of the Einstein equation yields a valid spacetime and mass-energy distribution. Gödel's 1949 solution resulted in a universe that rotates instead of expands. Additionally, it allowed for *Closed Timelike Curves*. Just as you can leave a point on a sphere, move westwards, and return to your starting point, the curved spacetime, too, allows the movement of an observer into the future and their arrival in the past.

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<sup>20</sup> The representation of the cosmological solution of Kurt Gödel follows Chris Smeenk and Christian Wütrich, "Time Travel and Time Machines." *The Oxford Handbook of Philosophy of Time*. Ed. Craig Callender. Oxford 2011. 577-632.

### **Progression and recursion as concepts of temporal narrative identity**

In what follows, it will be illustrated with the use of Ricoeur's analytical framework how the intersections between the formal organizations of music and physics lead to a conception of a temporal narrative identity for the yet-to-be-established community of whites and blacks.

Already, a fundamental analogy can be established between the three models: Bach's compositional challenge in *The Musical Offering* was to execute a pre-given theme with the counterpoint technique in such a way that the melodic and harmonic, the horizontal and the vertical dimensions come together in harmony. Gödel's cosmological model shows that every observer who follows his world line of chronological linearity and continually betakes himself into the future will arrive at his journey's point of departure in the past. Time stands still, linearity paradoxically emerges as cyclicity. Powers's novel, too, demonstrates, as already shown, this double pattern of progression and recursion: the chronological-linear and prospective narrative strand of the homodiegetic narrator is connected to the retrospective repetitive-recursive mode of narration of the heterodiegetic narrator. The structure of the novel suspends these aporias in a model of dissonant consonance: on the one hand, it is structured through the teleological principle of the melody, of the musical composition that strives towards an ending—a climactic finale, the *stretto*. On the other hand, the novel is structured according to the *Closed Timelike Curves* model, the model of Bach's *canon perpetuus*.

What functional relevance do the dialectics between progression and recursion have for the solution of the aporia of identity construction? According to Ricoeur, linear time is an identity threatening factor that can only be dissipated when “we can posit, at the base of [...] the uninterrupted continuity, a principle of *permanence in time*”.<sup>21</sup> The strongest criterion of permanence is that of structure, as it confirms the relational character of identity, defined as “the possibility of conceiving [...] change as happening to something which does not change”.<sup>22</sup> The dilemma of identity is solvable when it is undergirded with a structure that allows for permanence and change simultaneously.<sup>23</sup> This is the function of the *Closed Timelike Curves* which enable the dialectic between progression and recursion.

How do they contribute to the formation of an identity model? To tease out the dialectics of narrative identity, Ricoeur differentiates between two terms: firstly, that of identity as sameness in the sense of the unchanging self, the *idem*, recognizable and invariable

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<sup>21</sup> Ricoeur, *Oneself as Another*, 117.

<sup>22</sup> Ricoeur, *Oneself as Another*, 118.

<sup>23</sup> Ricoeur, *Oneself as Another*, 118.

throughout time. This would correspond with the first musical theme of the novel: “Time Stands Still;” secondly, the term of identity as selfhood in the sense of *ipse*, of selfhood as ipseity, which underlies a conception of identity that presupposes the changeability and mutability in time.<sup>24</sup> This corresponds with the musical counterpoint of the novel, the Jewish proverb of the bird and the fish, to which the same question receives variations of thirteen different existential answers.

Analogously to the DNA-double helix structure of the genetic code — which in connection with Bach’s *Goldberg Variations*<sup>25</sup> shapes the composition of the novel *The Gold Bug Variations* — I want to show how both the physical and the musical structural models, through isomorphic procedures, allow for the organization of a combinational system that is preserved in spite of constant variation. The *Closed Timelike Curves* as structural model underlie the narration and produce recurring patterns—in the *discours*, in the *histoire*, on a macro- and a micro-level—that skillfully replicate the pluridimensionality, simultaneity, and spatialization of Bach’s polyphonic technique. On the other hand, the variation of the counterpoint in the form of a riddle canon shows how a temporal identity is constituted and how it functions narratively. The novel offers thirteen conflicting answers to this question and thus names the aporias of identity formation. I cite two variations:

The bird and the fish can fall in love, but they share no word remotely like nest. (TS 231)

The bird and the fish can fall in love, but their only working nest will be the grave. (TS 470)

As one can see in this case as well, there is an invariant dimension—love as a firm foundation for marriage—and an unstable variable that continually questions the acceptance of the community, as well as this marriage’s very right to exist. What is interesting is that the time loop model, here on the micro-narrative level, is taken up as method: Yulia Kozyrakis has shown that the development of this theme corresponds with the structural scheme of a serial rondo, ABACADAFAG, in which the first verse always appears unaltered, but is continually modified and contextualized by the second verse.<sup>26</sup>

### **Reversibility, Nonsubstitutability, Similitude: Ricoeur’s Dialectical Identity Conception**

However, every community builds its identity according to the identity principle of sameness. Hereby, the inalterability of one’s self in distinction from the other is emphasized

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<sup>24</sup> Ricoeur, *Oneself as Another*, 113-168.

<sup>25</sup> Jay Labinger, “Encoding an Infinite Message: Richard Powers’s *The Gold Bug Variations*.” *Configurations* 3.1 (1995): 79-93.

<sup>26</sup> Yulia Kozyrakis, *Sightless Sound*: In: Kley 2012, 175-194.

and defended through rites and traditions. The novel laments that whites and blacks do not form their concept of identity on the dialectic between the self and the other. This is the next step in Ricoeur's conception of narrative identity: the dialectic of oneself as another. Ricoeur displays this step analytically into three elements: "reversibility, nonsubstitutability, similitude".<sup>27</sup> The first idea is reversibility which manifests itself in the semantic communicational code of the lovers: when I address the beloved with "you," they understand "I" for themselves. If they address me with "you," I feel implicated in the first person. From the perspective of linguistic communication, the roles of the sender and addressee are reversible.<sup>28</sup> The persons themselves are, however, not interchangeable, not when they come from different backgrounds: Jewish-German, African-American. In this regard, Ricoeur speaks of nonsubstitutability. The communicative acts of Delia and David are constantly affected by the dilemma of the reversibility of their roles as lovers and the nonsubstitutability of their roles as members of their own communities. The attempt at substitutability, at a crossing over from one community into the other, entails a dedifferentiation and a break with the conventional hierarchies for both communities. The generation of Jonah and Joseph as well, is, in its lifestyle and identity formation, concretely confronted with this dilemma of dedifferentiation. Delia's and David's educational project is risky, because Jonah, Joseph, and Ruth represent the commonalities between both communities and thus threaten all distinctions. Joseph as narrator laconically comments: "Our whole lives were a violation" (TS 68). Yet a way out of this dilemma is provided through the concept of similitude. Jonah and Joseph have the privilege, after all, not only to experience difference, but also similitude.

Even when initially only asymmetries exist between the self and the other, it is still possible, according to Ricoeur, to search for equality in passing through inequality.<sup>29</sup> This is the vision of the future imagined by Delia and David. Against the binary mode of thinking that only recognizes demarcation and differentiation, the novel posits a far more complex model of similitude. This does not simply entail the assimilation of one community by the other, but rather a willingness to be open towards each other, to recognize mutual influences, and to emphasize the continual crossovers that transcend demarcations.

In order to go down this path, it is necessary to step out of one's own system, to engage in second-order observation. This is made possible through artistic representation, which has the function of self-reflection in the sense of intersubjective transgression. On the one hand, on the level of the plot, the novel shows what historically is sanctioned. On the other hand, it

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<sup>27</sup> Ricoeur, *Oneself as Another*, 192f.

<sup>28</sup> Ricoeur, *Oneself as Another*, 192f.

<sup>29</sup> Ricoeur, *Oneself as Another*, 192.

aesthetically realizes the new mode of thinking, opened up by the intermental exchange between Delia and David. Through the aesthetic process, *The Time of Our Singing* performatively enacts that which sounds socially utopian, but can be literarily realized. Models and examples for this can be found in the legacies of the parents: the mother's art, namely music, and the father's science, namely theoretical physics. The original dilemma, the aporia of time, appears in this context as a solution. It is the common denominator between music and physics, to determine analogies as information-bearing isomorphisms which can be demonstrated by the narrative.<sup>30</sup> A whole string of compositional techniques that function, both in Bach's *The Musical Offering* as in the art of the fugue in general, as a means of augmentation and condensation, find their counterparts in the physical principles of the theory of relativity, as well as in the narrative organization of the novel. This can be illustrated through four processes: reversibility, time dilation, space contraction, and rotation.

#### **Reversibility, Time Dilation, Space Contraction, Rotation – in Music and Physics**

Formally, Bach's crab canon can function as a structural principle for the technique of the simultaneously prospective and retrospective narration. In this model, the first voice develops linearly, progressively. The second, imitating voice starts simultaneously and moves in reverse, from finish to start. Thus the two voices meet in the middle. In physics, this phenomenon is known as reversibility.

An important effect of the special theory of relativity is the phenomenon of time dilation. In music, we speak of augmentation, the lengthening of the note values. In *The Musical Offering*, Bach uses this technique in the *Canon a 2 – Per augmentationem*. In an augmented melody, the note values are twice as long as in the initial version, and the melody itself thus takes twice as long. The original experience of David and Delia's first meeting during the concert at the Lincoln Memorial is repetitively represented in the novel: twice in the dramatic mode of "showing." The aspect of duration plays an important role, as the narrated time amounts to four pages in the first scene and eight in the second. Just as with Bach, we get the doubled note values of augmentation.

The relativity of simultaneity, which David explains to his sons in the initiation scene, is responsible for both the time dilation and for the second effect of the special theory of relativity, i.e., the Lorentz contraction. This phenomenon, also called the length contraction, states that a moving observer measures a shorter distance between two points in space than an

observer at rest.<sup>31</sup> Musically, an isomorphism could be established to the technique of *diminution*, the shortening of tone-values. Bach uses diminution in the three-voiced *Ricercar* of *The Musical Offering*: the increasingly compressed rhythm leads to a halving of the note values. Jonah's participation in the musical competition with "Time Stands Still" takes up five pages in the exposition when told from the perspective of the remembering self, the observer at rest (TS 3-8). Two hundred pages later, the same scene told from the perspective of the remembered self, the moving observer, only takes up two and a half pages (TS 214-216). Thirdly, the suspension of absolute simultaneity and the introduction of the principle of the constancy of the speed of light allow for the observer of each frame of reference to measure their own proper time, which is one of the preconditions for the possibility of time travel in Gödel's model. These undergird the fourth information-bearing isomorphism, i.e., rotation. In Bach's *The Musical Offering* it finds its counterpart in the technique of the *canon perpetuum*.

As I have already mentioned, the key event that led to the marriage of the parents is told six times in the novel, meaning that the novel returns six times to the same space in time loops. The narrative account in the exposition depicts them in the mode of "telling" and describes Delia's and David's paths on two different world lines up until the Anderson concert in 1939. The fourth repetition is presented retrospectively and internally focalized through David. The scene of the action is the same place as before, Washington, but this time, the dominating voice is that of Martin Luther King who held his famous speech there, "I have a dream," in 1963. In the fifth repetition, Joseph is the leading voice, accompanied by his nephews, Ruth's children, at the 1995 Million Man March. On this occasion, Ode, the youngest nephew, disappears, and in the very last chapter we learn that he went into the past through a time loop and met David and Delia. At this point, the scene from 1939 is told again, the causal time curve closes, and it turns out that the figure that brought Delia and David together—which was mentioned in the first account but then remained unidentified—was Ode, their grandchild.

Through the rotational model, progression and recursion are conjoined, and personal time is embedded within the historical and mythical time. The *Closed Timelike Curves* model allows for the legitimization of the marriage, not based on the traditions of previous generations, but on the basis of the belief in the future of following generations, in name of a vision that is deemed utopian by their contemporaries but is symbolized by Ode. Through the *Closed Timelike Curves*, the physical, the musical, and the literary become possible. The

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<sup>31</sup> A generally comprehensible account of both effects can be found in Albert Einstein, *Über die spezielle und allgemeine Relativitätstheorie*. Berlin 2009. 11-25.

single events that appear contingently throughout the story each gain meaning retroactively through the emplotment, to the extent that they contribute to the identity formation. This is what happens with the contingent event of the death of the mother.

Following Hannah Arendt, Ricoeur understands identity as a category of action. Action is complemented with the question of how the temporal dimension of identity ascription can be represented. Ricoeur's answer is that the question concerning the identity of a person can only be answered through narration. This occurs through the description of the self as both the reading and writing of one's own life, through the description of the colorful fabric of stories from which we are constituted.<sup>32</sup> These identity stories only come into existence in conversation with the historical and fictional narratives that we are provided with in our cultural environment. In the case of Jonah and Joseph Strom it is the reception of mythical narrations: of Orpheus, Aeneas, and the canonical literary texts that provide the titles for the chapters that narrate their biographies, i.e., "My Brother as Othello," "My Brother as Faust." The chapters that are told in time loops are titled with historical-chronological circumstances that are of crucial importance to the establishing of the community: Marian Anderson's concert (1939), Martin Luther King's speech (1963), the Million Man March (1995). The model of simultaneous progression and recursion also becomes clear here, on the level of the representation of historical events. The retrospectively narrated time loops show how a community constitutes itself by continually retelling the events and narratives that are regarded as testimonies of their own founding history, like in a *canon perpetuum*.

The ending of Richard Powers's novel is enacted through a tripartite final movement that imitates the musical technique of the *stretto*, the impressive, virtuoso finale of a composition. In the novel, thereby, the theme and counter theme are, first of all, brought together on the level of the signifier. Secondly, the seemingly incompatible fields of music and physics are condensed on a conceptual level by the realization of a fundamental similitude, which offers a key to the solution of the aporia of identity. In the musical *stretto*, Joseph, as a music teacher in an African-American school, conducts the choir that his nephew, Ruth's son, leads vocally:

"We stayed in the swell, working our favorite rondo form [...] But as we crested one last time, I heard [...] my brother singing Dowland. The tune came from a life ago. The words from yesterday: Bird and fish can fall in love. [...] But where will they build their nest? Ruth's voice went through me like death." (TS 610)

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<sup>32</sup> Ricoeur, *Time and Narrative*, Vol. 3, 247.

In the closing rondo, the thematic commitments intersect, linking point and counterpoint, sameness and selfhood.

At the end of the novel, the scene of Delia and David's first meeting at the Anderson concert is told again. The theme of identity undergoes through Ode a new and last variation as a paradoxical future-oriented utopia in the past, which opens up a vision for the grandparents. Accordingly, the counterpoint as well goes through a last variation here:

“The bird and the fish can make a bish. The fish and the bird can make a fird.” (TS 631)

Thus these hybrid configurations from bird and fish—bish and fird—do not yield any semantic possibility for referentiality, no common language. Or do they? These hybrid word constructions symbolize the hybrid identity of the children and grandchildren in this family.<sup>33</sup> Once again it is Ode, this time in the physical stretto, who provides the keyword for this. He alone understands the message that his grandfather offers the future generations on his deathbed: “Tell her there is another wavelength everyplace you point your telescope” (566). Ode explains the fundamental analogy as such:

“Mama, wavelength's like color, right?” [...] “But pitch is wavelength, too?” [...] “Of course. The message was for him, her child. Not beyond color; into it. Not or; and. And new ands all the time. Continuous new frequencies.” [...] “More wavelengths than there are planets.” [...] “A different one everywhere you point your telescope.” (TS 627)

Colors are waves of light. Musical tones are waves of sound. Light waves and sound waves are both radiation, both part of a continuum wave spectrum. What separates them is only the waves' length and the increasing or decreasing frequency. They do merge, however. There is no dichotomous difference.

The dialectic between difference and continuum that I have analyzed structurally on the organizational level of the novel is mirrored on the level of content. Jonah and Joseph carry this basic idea of the similitude in the thinking of the self as another within themselves by birth. Through the composition of a family chronicle which draws its narrative procedures from two opposing fields that are combined through isomorphical analogies, Powers succeeds

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<sup>33</sup> On this point, my argument coincides with Heinz Ickstadt's, who reads this sense from the perspective of Dewey: “This pivotal moment, [...] on which Powers rests his narrative mediation between cultures, and which is also a meditation on hybridity.” Ickstadt, “Surviving the Particular? Uni(versali)ty and Multiplicity,” 9.



in narratively constellating the identity of the Strom family, in which the self is only made possible through the other, and the other is only constituted as a condition of the self. The result is not a narration in which whites are presented as agents and African Americans as victims. That would have been one-sided and asymmetrical. The positions are configured quite differently: the lack of complexity of the models with which both communities operate in order to construct their own identities is seen as deplorable. The one-sided thinking of both communities—the whites as well as the African Americans, who are neither of them willing to see themselves as the other, and are thus not capable of integrating a person who by birth belongs to both groups—is lamented.

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