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DELILLO SPECIAL ISSUE

'Freud is finished, Einstein's next': Don DeLillo's *Cosmopolis*, Chaos Theory, and Quantum Entanglement

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This essay argues that, in *Cosmopolis*, DeLillo returns to mathematical topics and formal structures, like those presented in *Ratner's Star*, and expands them to reflect more recent developments in science and technology to contemplate time—the subject that permeates many of his twenty-first century novels—and to highlight, variously, the unpredictable, uncertain, interconnected, and illusory nature of the contemporary world. Written in between the dot-com bubble burst and the aftermath of September 11, 2001, this essay asserts that *Cosmopolis* is liminal: it offers a glimpse of the ruins of the future, and as one of its rejected titles suggests, it approaches an omega point. Drawing heavily on archival research in the *Don DeLillo Papers* at University of Texas, Austin's Harry Ransom Center, this essay contends that *Cosmopolis* is a thought experiment, of sorts, in which DeLillo incorporates his substantial and ongoing research on strange attractors, quantum entanglement, and the physics of time to consider the "[t]wo forces in this world, past and future." In doing so, this essay suggests that DeLillo calls for a reassessment of the time in which this text is set and proposes an alternate way of perceiving the post-9/11 world.

Less than two years after September 11, 2001, Don DeLillo published his thirteenth novel, *Cosmopolis* (2003), a slim volume of just over 200 pages. Detailing cyber-capitalist Eric Packer's cross-town, daylong journey to get a haircut that culminates—seemingly—in his financial and physical demise, it received little love from reviewers. Michiko Kakutani declared it "dated" and "a major dud," which "declines to depict our post 9/11 world" and whose "portrait of a millennial Manhattan is hopelessly clichéd" ("Books of the Times"). Meanwhile, John Updike lamented that "nothing happens" and described the dialogue as "terse, deflective, somewhat lobotomized." Most seemed to agree that *Cosmopolis* is driven by concepts or themes, so much so, that Walter Kim exclaimed that the characters are "barely corporeal cerebral entities," who "aren't so much people as walking topic headings." He went on to complain that "[w]hen two or more of them gather to converse—about linguistics, economics, time or any of the hundred other frosty postdoctoral preoccupations that the author awards them in place of souls—the sounds they produce are so monotonous that it's not only hard to tell who's speaking, it's a mystery why they're even bothering."

Perhaps unsurprisingly, in the years since, literary scholars have taken up many of these "frosty postdoctoral preoccupations" and have attempted to explain why DeLillo bothered. A number have demonstrated that *Cosmopolis*—nearly complete before the terrorist attacks, but finished in their aftermath—does, in fact, speak to post-9/11 America, particularly when read in light of "In the Ruins of the Future," DeLillo's essay published a month after the Twin Towers collapsed.[1] Others have focused on the attention paid to obsolete language.[2] A handful have mentioned its tight form.[3] Some have investigated "the problem of rogue capitalism," "the financial

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[1] See, for example, Joseph M. Conte's "Conclusion: Writing Amid the Ruins: 9/11 and *Cosmopolis*" and Randy Laist's "The Concept of Disappearance in Don DeLillo's *Cosmopolis*." DeLillo has a slightly different opinion on the influence on 9/11 on *Cosmopolis*. As he explains in a *Chicago Sun-Times* interview: "I was fairly close to finishing when the terrorist attacks happened [. . . .] When that happened, I took a long pause. I just didn't want to work for a while, although I wrote an essay on the attacks themselves. The attacks didn't affect the novel directly, but they certainly affected me. In effect maybe two months was added on to the work."

[2] See David Cowart, *The Physics of Language*, particularly pages 210–226. Cowart also connects *Cosmopolis* to discussions of 9/11.

[3] See, for example, Nicole Merola in "*Cosmopolis*: Don DeLillo's Melancholy Political Ecology" and

sublime," or the role that the cyber-marketplace plays in the text.[4] A few have taken their cue from Sven Philipp, who claimed in an early review that "*Cosmopolis* illustrates what David Harvey has called the 'time-space compression' of the postmodern experience in a global, post-industrial world."[5] More than one critic has also attempted to analyze Benno Levin, Eric Packer's assassin and "doppelgänger" (Chandler 257).[6] There have been posthumanist readings and Freudian interpretations, but it seems that there are still some crucial "frosty postdoctoral preoccupations" that haven't been fully explored in relation to *Cosmopolis*, although they were also hinted at in early reviews or mentioned by DeLillo himself.

In a 2010 interview, DeLillo declared that "[t]he theme that seems to have evolved in my work during the past decade concerns time" ("An Interview"), a notoriously complicated subject that philosophers and physicists have been trying to explain for

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Russell Scott Valentino in "From Virtue to Virtual: DeLillo's *Cosmopolis* and the Corruption of the Absent Body."

[4] See Jerry A. Varsava's "The 'Saturated Self': Don DeLillo on the Problem of Rogue Capitalism" and Alison Shonkwiler's "Don DeLillo's Financial Sublime." Regardless of whether or not their discussions center on economics or globalization, a large percentage of the critics comment on the desire of Eric Packer "to get a haircut" (DeLillo 7), because, as Jerry Varsava notes, "[i]n the vernacular of 'the Street,' to 'take a haircut' suggests that one's investments have been rather severely trimmed by unfavorable market pressures" (103). See also Johannes Voelz "The Future's Epic Now: The Time of Security and Rish in Don DeLillo's *Cosmopolis*," *Reconstruction* 12.3 (2012), [n.p]; Aaron Chandler's "'An Unsettling, Alternative Self': Benno Levin, Emmanuel Levinas, and Don DeLillo's *Cosmopolis*," p. 253, and Shonkwiler, p. 275. However, a haircut might also just be a haircut, since found within DeLillo's research notes for *Cosmopolis* is a *New York Times* article, "MY MANHATTAN; Two Lollipops, and Take Little Off the Top, Please," by Michael Shapiro, about his six year old getting a haircut at an old school barbershop on Madison Avenue between 90th and 91st that sounds a lot like Anthony Adubato's shop down to the "ancient red, orange and green toy roadsters in which children sometimes sit while having their hair cut."

[5] In *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change* (1989), Harvey uses the term "compression" in "time-space compression" to denote the way "that the history of capitalism has been characterized by [the] speed-up in the pace of life, while so overcoming spatial barriers that the world sometimes seems to collapse inwards upon us" (240). He sees this as particularly true as "space appears to shrink to a 'global village' of telecommunications and a 'spaceship earth' of economic and ecological interdependencies [. . .] and as time horizons shorten to the point where the present is all there is" (240). Jerry Varsava (87), Aaron Chandler (241), and Nicole Merola (851) all allude to Harvey's concept of "time-space compression."

[6] See, for example, Randy Laist and Aaron Chandler.

centuries. This difficulty may account for David Foster Wallace's approach to explicating *The Body Artist* (2001):

> There is a joke I heard long ago – two young fish are swimming along and meet an old fish and he says "morning, boys, how's the water?" as he passes, and the two young fish look each other and go "What the fuck is water?"
>
> The best I can come up with is that *The Body Artist* is about this water. Equating water with diachronic/synchronic time, which is the tempting next move, would impoverish the book. (Letter to DeLillo)[7]

Wallace goes on to say "[i]t helps me read—or casts a backward light that illuminates some elements of other books of yours—Pee Pee Maw Maw and muteness in *GJS* [*Great Jones Street* (1973)], for example, or the schizophrenic's letter in *Ratner's Star*." Because *The Body Artist* immediately precedes *Cosmopolis* and because the research for these works seems to overlap in terms of date, as well as subject, Wallace's mention of *Ratner's Star* (1976) merits further investigation to see what light it might also cast on *Cosmopolis*.[8]

Although *Ratner's Star* has been described as a difficult and "exacting" text (DeCurtis 59), George Stade, an initial reviewer of DeLillo's fourth novel, declared DeLillo an "ingenious architect," applauding how "[p]lots are dislocated by juggernaut structures of ideas" and how "[r]eality, social or other is swallowed by mind."[9]

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[7] Others have noticed this attention to time, like Sam Anderson who, in his review of *Point Omega* published just a few months before the PEN America interview, wonders: "What is the slowest speed at which a plot can move before it stops moving altogether, thereby ceasing to function as a plot? And what kind of quantum transformations might take place at that moment of absolute-zero narrative momentum?" DeLillo repeats this joke in a letter to Harry Pallemans and agrees with Wallace, stating "I guess that is what *The Body Artist* is all about" (Coale 270). Wallace's joke also appears in *Infinite Jest*. See p. 445.

[8] For example, notes on *Time's Arrows: Scientific Attitudes Toward Time* (1985) by Richard Morris and *The End of Time* (1999) by Julian Barbour are found in the manuscripts for both. For research materials related to *The Body Artist*, see, for example, *Don DeLillo Papers*, Containers 6.3 and 6.4, for those related to *Cosmopolis*, see, for example, Containers 9.6 through 9.9 and 10.

[9] In her review of *Point Omega*, Michiko Kakutani makes a similar comment noting that, like many of DeLillo's other works, "it has an ingenious architecture that gains resonance in retrospect" ("Make War").

Even DeLillo concedes a "reader would have to earn his way into *Ratner's Star*," which is very much tied to the "juggernaut structure of ideas" alluded to by Stade (DeCurtis 59). As DeLillo explains:

> It seems to me that *Ratner's Star* is a book which is almost all structure. The structure of the book *is* the book. The characters are intentionally flattened and cartoonlike. I was trying to build a novel which was not only about mathematics to some extent but which itself would become a piece of mathematics. It would be a book which embodied pattern and order and harmony, which is one of the traditional goals of pure mathematics (DeCurtis 59–60).

Ratner's Star is neatly divided into two parts—one represents a specific set of characteristics: the other reflects their opposite. The first half alludes to Lewis Carroll's *Adventures in Wonderland* (1865), the second to *Through the Looking-Glass* (1871). Part one is further subdivided into twelve chapters to mirror the structure of *Adventures in Wonderland*, each of which traces the history of mathematics from its beginnings in Mesopotamia to Isaac Newton and then on to Georg F. L. P. Cantor and set theory.[10] Beyond form, the content of *Ratner's Star* also incorporates math and science, touching on the Big Bang theory, alluding to Einstein, discussing the existence of black—as well as white—holes, and introducing "moholes:" "part of a theoretical dimension lacking spatial extent and devoid of time value" (*Ratner's Star* 181).

While John Barron of the *Chicago Sun-Times* reported that DeLillo's "fictional dispatches are not the result of research" (or so DeLillo apparently led him to believe), anyone who has read DeLillo closely knows this to be false, even if they haven't had their thoughts confirmed by the numerous files marked "research" and "clippings" found within the *Don DeLillo Papers*. Moreover, there are certain subjects—like John F. Kennedy's assassination, mathematics, and science—that DeLillo keeps an eye on years after completing a novel, which is why there are *New York Times*

[10] For a detailed breakdown of the form of *Ratner's Star* and its connection to Lewis Carroll's work, as well as the history of mathematics, see the *Don DeLillo Papers*, 50.3. DeLillo also notes *Ratner's Star*'s form and its connection to mathematical themes in his interview with Bou and Thoret.

articles from late 1980s and early 1990s found within the source materials for *Ratner's Star* related to the resolution of Fermat's Last Theorem, the recognition of Srinivasa Ramanujan, and the possible discovery of dark matter.[11] But, DeLillo didn't stop then; he has continued to follow developments in mathematics and cosmology, becoming increasingly interested in the latter, as well as quantum physics. Consequently, although DeLillo revealed that he was surprised to find himself returning to tropes and themes in *Cosmopolis* that he initially explored in *Ratner's* Star, we should not be (Bou).

In *Cosmopolis*, DeLillo returns to mathematical topics and formal structures, like those presented in *Ratner's Star*, and expands them to reflect more recent developments in science and technology to contemplate time—the subject that permeates many of his twenty-first century novels—and to highlight, variously, the unpredictable, uncertain, interconnected, and illusory nature of the contemporary world.[12] Specifically, "the day on which [*Cosmopolis*] was set was the end of an era," as DeLillo explains, one that "quite clearly delineated between the end of the Cold War and the beginning of the current period of terror" (Bone). *Cosmopolis* is liminal: situated at the point when the dot-com bubble bursts, it offers a glimpse of the ruins of the future, and as one of its rejected titles suggests, it approaches an omega point. *Cosmopolis* is a thought experiment, of sorts, in which DeLillo considers the "[t]wo forces in this world, past and future" ("Ruins"), illustrating the tension between them through his use of strange attractors and quantum entanglement. In doing so, DeLillo calls for a reassessment of the time in which this text is set and proposes an alternate way of perceiving the post-9/11 world.

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The form of *Cosmopolis*, like that of *Ratner's Star*, reveals a core thematic concern of its content. *Cosmopolis* is symmetrical: it is comprised of two parts, each made

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[11] See, for example, "Mathematics Expert May Soon Resolve a 350-Year Problem" (*New York Times*, 10 March 1988) and "An Isolated Genius Is Given His Due" (*New York Times*, 14 July 1987), both by James Gleick, as well as "2 Teams See Signs of What May Be Dark Matter" (*New York Times*, 21 September 1993) by John Noble Wilford.

[12] *Cosmopolis* isn't the only work in which DeLillo draws upon quantum physics or chaos theory. See also, Samuel Chase Coale and Gordon E. Slethaug, e.g., pages 49–60 and 79–95.

up of two chapters which are, in turn, divided by one half of *The Confessions of Benno Levin*. One might say that it follows natural patterns: it has six sides like a snowflake; or, from a different perspective, it branches like a tree leaf. *Cosmopolis* also contains two interconnected narratives: one focused on the aforementioned Eric Packer, the other on Benno Levin (aka Richard Sheets). Eric's begins in the morning and ends at night, moving from east to west across 47th Street in New York from 1st Avenue to 12th. Benno's, on the other hand, moves from night to morning and from west to east, starting at 12th Avenue, with the two characters paths crossing roughly in the middle of Manhattan on 5th Ave (as E. 47th turns to W. 47th). In "*Cosmopolis*: DeLillo's Melancholy Political Ecology," Nicole M. Merola explains that "one narrative, Packer's, runs forward in time while the other, the interchapters, runs backward" (841); however, as Vija Kinski, Eric's chief of theory asserts, "[w]e used to know the past but not the future. This is changing [. . . .] We need a new theory of time," one that forces us to "[t]hink outside the limits" (DeLillo, *Cosmopolis* 86, 21).

The particularly Western cultural notion of "abstract, linear time"—the sense that time is divided into a past, present, and future—emerged as the dominant way of thinking in the Renaissance with the growth of capitalism (Morris 13, 32). As Kinski explains in *Cosmopolis*, "[c]lock time accelerated the rise of capitalism. People stopped thinking about eternity. They began to concentrate on hours, measurable hours, man-hours, using labor more efficiently" (DeLillo 79). And this idea of time (and space for that matter) as absolute was held as truth from the seventeenth century until the early twentieth century, when the classical laws of Newtonian physics and notions of a clockwork universe were dismantled. These scientific advances, beginning with the findings of Albert Einstein and continuing on with the development of quantum physics, offer new theories of time, in addition to some different ways of thinking about *Cosmopolis*.

As Huw Price explains in *Time's Arrow and Archimedes' Point: New Directions for the Physics of Time*, "the fundamental laws of physics appear to be (almost) symmetric with respect to time. Roughly, this symmetry amounts to the principle that if a given physical process is permitted by physical laws, so to

is the reverse process" (18).[13] Put another way using some common examples, according to the laws of physics, there isn't any reason that a broken wine glass couldn't reassemble itself or ripples in a pond couldn't move toward the tossed pebble. The reason that we don't see the world like a film run in reverse, although theoretically possible, as Price's book title suggests, is because of "time's arrow:" time asymmetry. Consequently, with this in mind, one could, potentially, read *Cosmopolis* from the last chapter back to the first, so that *The Confessions of Benno Levin* appeared in the "correct" chronological order.

Regardless of where one begins or ends, *Cosmopolis*' manipulation of time goes beyond its form and is omnipresent in its content. As soon as Eric is introduced, he declares: "Freud is finished, Einstein's next" (DeLillo 6). Einstein's Theory of Special Relativity, which Eric happens to be reading, proved that, contrary to Newton's assertions, time is relative.[14] As a result of Einstein's work, things that were thought to be fundamental characteristics of time, like "duration, length, past, present and future can no longer be regarded as a dependable framework within which to live our lives;" they are elastic, and "their values depend on precisely who is measuring them" (Davies, *Other Worlds* 42).[15] As such, Einstein's theory tested what people thought they knew (and could know) about the universe, and those challenges kept coming.

While Einstein remained primarily focused on unraveling the mysteries of the cosmos, others, like Niels Bohr, built upon Einstein's ideas—particularly the

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[13] Once again, this title is found within DeLillo's research notes for *Cosmopolis*.

[14] The Theory of Special Relativity, perhaps most recognizable by its equation $e=mc^2$, concluded that "the speed of light [186,000 miles per second] is the same everywhere for everybody" (Davies, *Other Worlds* 37). As for the assertion that time is relative, put another way, "time measurement made by observers in different states of motion will not agree with one another," Richard Morris explains in *Time's Arrow: Scientific Attitudes Toward Time* (1985), yet another title found among DeLillo's research notes (150). As Morris continues: "it is simply not possible to define the exact time at which a distant event took place. In fact, it is perfectly possible for a distant event to take place in the 'past' of one observer and in the 'future' of another" (150).

[15] As with most of the scientific sources cited in this article, Paul Davies' *Other Worlds* is also found in DeLillo's notes for *Cosmopolis*.

photoelectric effect—and applied them to the subatomic realm.[16] It is impossible to detail all of the characteristics of the quantum world here, but suffice it to say that it is strange and "reads like something from *Alice in Wonderland*" (Davies, *Other Worlds* 9). As Davies explains, it creates the possibility of parallel worlds; it suggests that time does not "flow;" it establishes "the inherent uncertainty of the subatomic world;" and it proves that, "at least on the atomic level" and, taken to the logical extreme, perhaps at the super-atomic level as well, "matter remains in a state of suspended animation of unreality until an actual measurement or observation is performed" (Davies, *Other Worlds* 15, 12–13).[17] All of these assertions further contested previously accepted ways of understanding the world, but the last was one that even Einstein could not abide, as "he believed that the world exists independently of minds and observations" (Price 202). While everything in the universe is comprised of particles that are theoretically governed by the weird laws of quantum mechanics, Einstein wasn't buying it, as the legend goes: "Do you really believe, Einstein once asked a younger colleague, that the moon exists only when you look at it?" (Johnson).[18] Here, Einstein points out the fundamental incompatibility between the physics of the quantum world and that of general relativity. Or, as Brian Greene explains in *The Elegant Universe* (1999), "[o]n ultramicroscopic scales [sub-Planck length], the central feature of quantum mechanics—the uncertainty principle—is in

[16] One such idea is that of time dilation, which gives rise to the twin paradox and the possibility (if one were to build a spaceship fast enough) that one identical twin could age more quickly if one were on earth and the other traveling in the spaceship. This might allow for an interpretation of why it takes Eric all day to get across 47th Street; or, the amount of time might simply be explained by Manhattan traffic on a day with a presidential visit, a burning bus, a protest, a water main break, a large celebrity funeral, and a film shooting, as well as three meals and three sexual encounters (not counting the one that occurs in the car with Jane Melman).

[17] The importance of the observer to quantum theory is often explained with the thought experiments/paradoxes of Schrödinger's cat or Wigner's friend (Davies, *Other Worlds* 13), while Heisenberg's Uncertainty Principle enshrines the issues regarding measurement and uncertainty. For an in depth discussion of quantum theory generally, see Davies' *Other Worlds*.

[18] This *New York Times* article by George Johnson, "In Quantum Feat, Atom Is Seen In 2 Places At Once," is also found within DeLillo's research materials for *Cosmopolis*.

direct conflict with the central feature of general relativity—the smooth geometrical model of space (and of spacetime)" (129).[19]

Seeking to undermine Werner Heisenberg's Uncertainty Principle, which essentially states that "[t]here is no way, even in principle, to acquire precise information about both the position and momentum of a subatomic particle," around 1935, Einstein, along with Boris Podolsky and Nathan Rosen (who collectively became known as EPR), designed a set of experiments to challenge Bohr and others, who believed that there was "evidence of deep entanglement between observation and reality" (Davies, *Other Worlds* 60–61; Price 202). EPR used "a pair of particles, or physical systems, which interact and then move apart," now known as entangled particles, because "[p]roviding the interaction is set up in the right way, quantum theory shows that the results of measurements on one particle enable us to predict the results of corresponding measurements on the other particle" (Price 202).[20] Einstein thought that this was ridiculous, arguing that quantum theory was incomplete because "if we can predict either the measured position or the measured momentum of a particle without interfering with it in any way, then it must have some property [a hidden variable] responsible for the results of those (possible) measurements" (Price 202).[21]

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[19] I have yet to find references to theoretical physicist Brian Greene's work among the *Don DeLillo Papers*, although there is a chance that DeLillo was aware of Greene's writing. In particular, DeLillo's source materials demonstrate that he consistently follows the *New York Times* and George Johnson reviewed *The Elegant Universe* for the *New York Times Book Review* on 21 February 1999. Regardless of whether or not DeLillo was aware Greene, Greene's work is particularly accessible to a non-scientific audience and so it is included here. For those interested, a Planck Length is 10^{-33} centimeter (Greene 130).

[20] To give a specific example of what this means, in this case one again presented by Brian Greene, consider an electron whose spin, according to quantum theory, would remain fuzzy or uncertain until it is measured at which point it would either spin clockwise or counterclockwise. Next, imagine two electrons that are entangled, which means that they would be linked: sharing properties and remaining inextricably connected even at a great distance. According to the laws of quantum mechanics, when one electron's spin is measured as clockwise, the other in the entangled pair would then be counterclockwise, regardless of distance.

See *Nova: The Fabric of the Cosmos*, "Quantum Leap" hosted and based on the book by Brian Greene (Dirs. Julia Cort and Josh Rosen, s39 e7, 2011).

[21] In his EPR experiment, Einstein assumed "that physical effects are *local*—that there is no action at a distance;" however, by the 1960s, John Bell, in his eponymous theorem, established "that in order to explain what quantum mechanics predicts about EPR cases, a hidden variable theory would need to be nonlocal" (Price 203, 216).

But, as technology progressed, the EPR experiments and subsequent related theorems could be tested; and, physicists were actually able to prove that Einstein's so-called "spooky action at a distance" was true.[22] Put another way, as Davies explains, "[i]n the commonsense view of the world we regard two things as having separate identities when they are so far apart that their mutual influence is negligible. Two people, or two planets, for example, are regarded as distinct things, each with its own attributes;" this is not the case in quantum theory: everything is interconnected (*Other Worlds* 124–125). Moreover, while this inherent uncertainty and entanglement was previously limited to the subatomic level, by 2000, scientists started to take the strange behavior of particles beyond that realm, manipulating an atom so that it appeared in two places at once, opening up the possibility that this could happen with larger objects as well, a fact that DeLillo learned in a *New York Times* article that also includes the anecdote of Einstein's crack about the moon (Johnson).

In the decades since Einstein's death, scientists have not satisfactorily resolved the apparent irreconcilable differences between the physics of the super- and sub-atomic worlds. More than one has attempted to unite them through, among others, string theory and parallel universe (multi-verse) theory—both of which DeLillo was aware of.[23] But, while scientific proponents of these theories must prove that they satisfactorily meet accepted criteria, DeLillo is not subject to these standards and, as such, is free to present what might considered thought experiments in his work, where behaviors of the quantum world creep into the super-atomic one that we experience every day.

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[22] One such theory is that of John Bell, see for example Price pp. 212–219. For more about these physicists, like John Clauser and especially Alain Aspect, see *Nova: The Fabric of the Cosmos*, "Quantum Leap."

[23] DeLillo appears to have a passing familiarity with superstring theory as it is mentioned in Julian Barbour's *The End of Time*, Paul Davies' *About Time: Einstein's Unfinished Revolution* (1995), and a number of *New York Times* articles found among his research materials for either *The Body Artist*, *Cosmopolis*, or both. String theory is also alluded to in the aforementioned article on Srinivasa Ramanujan discovered among the clippings in his *Ratner's Star* manuscripts. However, DeLillo seems to have been more interested in parallel universe theory, which is the focus of Paul Davies' *Other Worlds*, as well as Fred Alan Wolf's *Parallel Universes: The Search for Other Worlds*, both of which are found among his research notes, among other sources on the subject.

Unlike Einstein, in *Cosmopolis*, Eric Michael Packer seems to embrace the beliefs of Bohr and others, accepting the idea of a "deep entanglement between observation and reality" (Price 202). Eric has profound confidence in his ability to measure, observe, and fix the world around him. In particular, as DeLillo notes, "Eric Packer finds the hidden structures of financial markets in nature," through "mathematical theories and the density of the schemas that mathematicians find in numbers," not unlike *Ratner's Star* (Bou). But, DeLillo is quick to clarify that Eric's approach

> is not something [he] invented. There are men and women who do that. They take it very seriously and occasionally write books about it. For example they study the life cycles of butterflies and find universal themes that they connect with the way the planets rotate around the sun. (Bou)

In finance, people who attempt to discern patterns in market data to forecast future developments are known as technical analysts, and one book that covers some of the methods of this approach is *The Psychology of Technical Analysis: Profiting from Crowd Behavior and the Dynamics of Price* (1989) by Tony Plummer, which happens to be a title found among DeLillo's research notes for *Cosmopolis*.[24]

Hoping to "upgrade [technical analysis] from a 'black box' art to a more acceptable science" (15), Plummer nods toward Heisenberg's Uncertainty Principle, alludes to systems theory, diagrams feedback loops, dissects (market) life cycles, and then declares:

> Natural forces encourage people to indulge in group behaviour. Groups *behave as single organisms*: they therefore respond in a predictable way to information shocks, they have metabolic (emotional) cycles, and they follow a definable path of growth and decay. (60, emphasis in original)

As a result, for Plummer, one "obvious rule for successful investment is to keep a close watch on what other investors are saying and doing, and then, when a vast

[24] See *Don DeLillo Papers*, 9.7.

majority are saying and doing the same thing, do the reverse" (69). Plummer, however, strives for a more scientific approach for his method and asserts that "[u]nlike any other crowd [. . .] the behaviour of financial market crowds is clearly reflected in simple, and specific, indicators [. . . .] Logically, these indicators should reflect the operation of the appropriate 'natural' laws" (60). These indicators—like price movements and trading volume—"are part of a very simple pattern," which like trees, shells, art, the human body, and the universe, according to Plummer, are governed by the Fibonacci sequence (60, 105–117).[25] Consequently, because the price movements are constrained by the golden ratio (known as phi or ϕ) and because there are "a limited number of price *patterns*," given enough market data, a technical analyst could, potentially, forecast market behavior (Plummer 272, emphasis in original).

As an assets manager who has consistently outperformed the market and who has "never been influenced by the sweep of the crowd," Eric Packer pays close attention to numbers and is surrounded by them (DeLillo, *Cosmopolis* 53). On this day in April 2000, Eric leaves his nine hundred-feet high, eighty-nine story residential building (pointing out that eighty-nine is "a prime number"), notes the ten cars lined up outside, and gets into his own, equipped with an "array of visual display units," where he sits looking at the "medleys of data on every screen, all the flowing symbols and alpine charts, the polychrome numbers pulsing" (DeLillo, *Cosmopolis* 8–9, 13).[26] Eric's focus is on the yen, which keeps rising against expectations. Michael Chin, Eric's currency analyst who joins him in his limo, believes "we may be leveraging too rashly" because "[w]hat is happening doesn't chart" (21). However, Eric remains firm: "It charts. You have to search a little harder. Don't trust standard models" (21). Chin offers advice based on the accepted price patterns, which "chart" in recognizable

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[25] Ralph Nelson (R.N.) Elliott was the first to use the Fibonacci sequence in technical analysis, as explained in *The Wave Principle* (1938).

[26] DeLillo does not specify which day in April 2000; however, the date does place it within the period of the dot-com bubble bust, which many sources begin on March 10, 2000. See, for example, "March 10, 2000: Pop Goes the Nasdaq!" by Tony Long (*Wired*, 10 March 2010). In addition, Eric's near constant connection to an electronic stream of information has caused Randy Laist to declare him "*homo technologicus*" and to comment on elements of posthumanity in *Cosmopolis* (258, 261).

ways—e.g., the head-and-shoulders top, reverse head-and-shoulders bottom, double top, double bottom—and, according to Plummer, within the constraints of the golden ratio.[27] But, Eric pushes Chin to "[t]hink outside the limits. The yen is making a statement. Read it. Then leap" (DeLillo, *Cosmopolis* 21). Chin remains doubtful, maybe because, as someone with "advanced degrees in mathematics and economics," he knows that ϕ, like π, is an irrational number with an infinite number of non-repeating, non-terminating decimals, which makes thinking "outside the limits" an interesting prospect (21–22). Eric, however, offers some insight as to what he has in mind when he turns his attention back to the data streaming across his screens. He notes that "[h]e studied the figural diagrams that brought organic patterns into play, birdwing and chambered shell" (24). The latter image invokes perhaps the most recognizable natural example of the golden spiral, while the first image suggests something slightly different: the Lorenz attractor.

Discovered by Edward Lorenz in the early 1960s, the attractor makes "a strange, distinctive shape, a kind of double spiral in three dimensions, like a butterfly with two wings" (Gleick 30). As with other strange attractors, such as the Mandelbrot set or the Koch Snowflake, "[t]he shape signal[s] pure disorder, since no point or pattern of points ever recur[s]. Yet it also signal[s] a new kind of order" (Gleick 30). Illustrating what became known as "the Butterfly Effect—the notion that a butterfly stirring in the air today in Peking can transform storm systems next month in New York" (Gleick 8), the image is particularly appropriate. With it, chaos theory, as well as the proven knowledge that the world is inherently unpredictable came into being.[28]

Similar to the weather that Lorenz was attempting to determine, people desperately want accurate predictions of the stock market; however, the market is

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[27] See Plummer, "Price Patterns in Traditional Technical Analysis," pp. 133–149.

[28] James Gleick recounts the discovery of the Lorenz attractor and its repercussions in *Chaos: Making a New Science* (1987), another title found in DeLillo's source materials for *Cosmopolis*. Briefly, strange attractors are defined as a stable, nonperiodic behavior exhibited by a chaotic system that can be represented as a non-repeating pattern in the system's phase space ("strange attractor"). For a full explanation of "strange attractors," see Gleick, pp. 121–153.

also a complex system. Thus, theoretically, strange attractors govern the market, too, and economists have looked for them in stock trends for decades hoping to gain a forecasting advantage.[29] Like Lorenz, Benoit Mandelbrot, a sometime economist, turned to the computer to assist him with his calculations.[30] He examined decades of historical cotton price data—a process now known as backtesting—working to go beyond the "standard model" of the bell curve "looking for patterns not at one scale or another, but across every scale [. . . .] he knew there would have to be a kind of symmetry" (Gleick 84, 86). What he found through his experimentation, while not a specific strange attractor of the market, was that although "[e]ach particular price change was random and unpredictable [. . . .] curves for daily price changes and monthly price changes matched perfectly" (Gleick 86). Additional testing by Mandelbrot with other, non-economic data demonstrated that regardless of scale, "the world displays a regular irregularity" (98). As it so happens one of Mandelbrot's most recognizable fractals—as his infinitely repeating, self-similar patterns are called—resembles the chambered shell.

In *Cosmopolis*, Chin is concerned that his data doesn't chart accordingly to standard models—let alone a birdwing or chambered shell—but he doesn't give up on them. He announces that when he returns to the office, he will continue to backtest currencies on ever-smaller scales, proclaiming that he does "time cycles in [his] sleep. Years, months, weeks. All the subtle patterns [he's] found. All the mathematics [he's] brought to time cycles and price histories. Then you start finding hourly cycles.

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[29] As Gleick notes, scientists, programmers, governments, and financial institutions, among others, have spent significant time and money on predictive models (20). Although Gleick states that economists had not found a strange attractor as of 1987 (307), he declares that chart patterns are, in fact, strange attractors in his 2008 Afterword to the 20th Anniversary Edition of *Chaos*, five years after the publication of *Cosmopolis*. However, Plummer does note the connection between technical analysis and chaos theory in his Preface to the Second Edition of *The Psychology of Technical Analysis* (1992).

This search for new order amongst the disorder continues in the field of finance. Recently, the particle physicist who discovered the quark, George Zweig, was in the news because he is starting a hedge fund. According to the *Wall Street Journal*: "'It's a fantastic challenge,' Mr. Zweig said, of trying to create new quant strategies from scratch and finding order from the numbers and chaos in the markets."

[30] Although some, like R. N. Elliott, had performed mathematical analyses earlier, the search began in earnest in the 1960s with Benoit Mandelbrot, an employee of IBM.

Then stinking minutes. Then down to seconds" (DeLillo, *Cosmopolis* 37). He declares he will "need to retrace events over time and see what [he] can find that applies" (37). Eric, once again, dismisses the standard models, adamantly stating that "[n]othing applies. But it's there. It charts" (37). As Eric asserts later, "[h]e knew there was something no one had detected, a pattern latent in nature itself, a leap of pictorial language that went beyond the standard models of technical analysis and out-predicted even the arcane charting of his own followers in the field" (63). In essence, he is in search of the elusive strange attractor, but one that takes into consideration the new conditions of the electronic, dot-com era.

However, Eric's desire to observe and measure the reality of his current situation goes beyond his continuing attempts to chart the movements of the yen using backtesting and technical analysis, but rather concern other issues of time. After articulating the history of time in relation to traditional capitalism, Kinski suggests "it's cyber-capital that creates the future," and then asks "[w]hat is the measurement called a nanosecond?" (DeLillo, *Cosmopolis* 79). Eric explains that it is "[t]en to the minus ninth power" or "[o]ne billionth of a second" (79). Kinski claims that she doesn't understand any of it (cyber-capital, the data flowing on the screens, or infinitesimal divisions of time), "[b]ut it tells [her] how rigorous we need to be in order to take adequate measure of the world around us" (79). Eric emphasizes her point volunteering that there are other units: zeptoseconds (10^{-21}) and yoctoseconds (10^{-24}) (79). All of these fractions of a second occur at the subatomic level, bringing their discussion to the brink of Planck time (10^{-44}), the briefest physically meaningful span of measurable time, as determined by Max Planck, one of the founders of quantum physics.[31]

As a result of this ongoing, increasing precision, for Kinski, "[t]he present is harder to find [. . .] The future becomes insistent" (79). And while Kinski links this difficulty of pinpointing a "*now*" to the rise in cyber-*capital*, the emphasis should be on *cyber*. For Eric, technical analysis focused on human psychology alone à la Plummer is no longer sufficient. As Eric explains

[31] For a discussion of Planck time, see Morris, pp. 194–213.

> [i]t was shallow thinking to maintain that numbers and charts were the cold compression of unruly human energies, every sort of yearning and midnight sweat reduced to lucid units in the financial markets. In fact data itself was soulful and glowing, a dynamic aspect of the life process. This was the eloquence of alphabets and numeric systems, now fully realized in electronic form, in the zero-oneness of the world, the digital imperative that defined every breath of the planet's living billions. Here was the heave of the biosphere. Our bodies and oceans were here, knowable and whole. (DeLillo, *Cosmopolis* 24)

Zeros and ones transmitted by electrons—one might be tempted to think of this "soulful and glowing" data that envelops the world as an advancement of the *noosphere*, defined by Pierre Teilhard de Chardin as "the 'thinking layer', which [. . .] has spread over and above the world of plants and animals" (182). Regardless, these bits of information have not only become inseparable from life (human and otherwise), but Eric implies they also have a vitality of their own. Whoever understands this shift in the nature of the world and can read the signs hidden within could, potentially, unlock its secrets.

Paul Virilio's thoughts in *Open Sky* (1995) published just after the birth of the World Wide Web and found within DeLillo's research notes for *Cosmopolis* offer further insight. For Virilio, with echoes of Einstein, "space-time [has been] turned on its head by the teletechnologies of action at a distance," leading to "the sudden eruption of the 'world-city,' totally dependent on telecommunications" (59).[32] If *Cosmopolis*—roughly translating, as Russell Scott Valentino notes, to "world-city"—is, as DeLillo asserts, a work that, "first of all, is talking about the relation that exists between Time and Money," then, like Eric suggests, standard models of thought concerning

[32] While Harvey was describing a pre-Internet world, it is easy to see why Philipp and others thought of "time-space compression." DeLillo seems to suggest something similar, as he explains in his *Chicago Sun-Times* interview: "The market began to falter when it does in the book, which is the spring of 2000. It happens faster in the novel because everything happens faster in a novel. And that's the reason behind the exaggerated reality. There's a sense of acceleration of time and of reality itself" (Barron).

the stock market in the digital age need to be challenged, as do the ways in which we explain the world to ourselves (Valentino 152; Bou). Or, as Kinski phrases it, and as mentioned earlier, "[w]e need a new theory of time" (DeLillo, *Cosmopolis* 86). However, attempting to "think outside the limits" of conventional approaches can appear irrational; as Eric tells Chin, "[a]ny assault on the borders of perception is going to seem rash at first" (21).

Nearly instantaneous electronic transmission of information creates the perception of accelerated time; as Virilio declared, space-time is "turned on its head" through "action at a distance" (59). "Teletechnologies," to use Virilio's term, enable Eric to watch "in obsessive replays" the assassination of "Arthur Rapp, managing director of the International Monetary Fund" in Nike North Korea, although it "[h]appened only a minute ago," and, like the Red Queen in *Through the Looking-Glass*, as these images rush by Eric hasn't moved from his original location: he remains stuck in traffic approaching Lexington Avenue (DeLillo, *Cosmopolis* 33). "Teletechnologies" permit Eric to access and monitor the live, worldwide, streaming video feed of Midwood, the President of the United States, who, after ten minutes of observation seems "to exist in some little hollow of nontime" (76). They also help explain why, in an example of the Butterfly Effect in action, "the whole economy convulses" because the Japanese finance minister "took a breath" (48).

However, even the aforementioned assertion by Virilio doesn't go far enough; it isn't just that spacetime has been disrupted, but, as Virilio later suggests, in our electronic age, we are "at the very moment when we are witnessing the liberation of time's arrow" (122). According to quantum physics, "[t]he objective world *is* spacetime, with all events, for all times, included. There is no present, no past, no future," those qualities are purely subjective (Davies, *Other Worlds* 46). Time is not only relative, but all instants are also equally extant; consequently, what we think of as the "flow of time" is an illusion (Davies, *Other Worlds* 189). Moreover, as theoretical physicist Fred Alan Wolf asserts in *Parallel Universes: The Search for Other Worlds* (1988):[33] "Our minds are time machines, able to sense the flow of possibility

[33] This title with notes is found among DeLillo's research materials for *The Body Artist*. See *Don DeLillo Papers*, 6.5.

waves from both the past [alpha point] and the future [omega point]. In [Wolf's] view there cannot be anything like existence without this higher form of quantum reality" (310).[34] Wolf continues "[i]f it turns out to be a testable hypothesis, it will revolutionize our view of the world. It will say in effect that time is not a barrier. The future exists now, and so does the past" (310). Or, in DeLillo's words found among his notes, "it's all perceptual."[35] With this in mind, perhaps unsurprisingly, disruptions of linear time appear throughout *Cosmopolis* and, similar to a subatomic particle, each jump is connected to Eric observing himself on a screen of one sort or another, culminating in the final scene with Benno Levin.[36]

As noted above, DeLillo entwines the narratives of Eric and Benno in the structure of the text. Their lives are also inherently interconnected, so much so that they resemble entangled quantum particles. Eric employed Benno at one point as a currency analyst, but the fusing of these characters is a result of the new zero-oneness of the world. Previously, Eric's image, like Midwood's, was "accessible nearly all the time, videostreamed worldwide from [his] car," and Benno "watched the live video feed from [Eric's] website all the time [. . .] for hours and realistically days" (15, 151). For Benno, "[i]t was important to know where he was, even for a moment. It put [his] world in order" (151). Benno monitored Eric nearly constantly, believing that he "was [Eric's] human sensor, reading his thoughts, knowing the man in his mind" and that his "life was not [his] anymore" (153).

After Benno loses his job at Packer Capital, Eric's influence continues, and Benno nearly becomes Eric's polar opposite. Eric lives in a $104 million, forty-eight-room triplex near 1st and E. 47th; Benno squats in a "derelict," window-boarded tenement

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[34] See Wolf pp. 300–308 for a discussion of "Alpha and Omega."

[35] See *Don DeLillo Papers*, 9.9.

[36] For example, the first of these "jumps in time" (DeLillo's phrase) occurs almost immediately after Eric tells Chin that "[a]ny assault on the borders of perception is going to seem rash at first." As Eric "watched himself on the oval screen below the spycam," he "realized queerly that he'd just placed his thumb on his chinline, a second or two after he'd seen it on-screen" (21–22). Another happens as he watches himself orgasm in close proximity to Jane Melman, after which "[h]e felt his body catching up to the independent image" (52). One of the last, before meeting up with Benno, occurs as he sees "himself recoil in shock" and, after the passage of some time, the bomb outside of the investment bank finally goes off (93–94). The length of delay between what Eric sees and when it occurs increases with each of the jumps.

on 12th and W. 47th (179). Eric surrounds himself with technology that is "nearly touchless;" Benno "liv[es] offline" and "writ[es] longhand in pencil" (13, 149). Eric is concerned with zeptoseconds; Benno doesn't "own a watch or a clock" and "think[s] of time in other totalities now" (59). Ultimately, Benno has decided to kill Eric, perhaps to sever the connection and free himself, as Benno asks: "how do I live if he's not dead?" (154).

The pull of this connection also seems to be felt by Eric. Generally, Eric's behavior is unpredictable and uncertain: he is known to move "about the city without pattern" and "[e]ven at the firm, it was not easy to find his office. It changed all the time" (56). Yet, Eric's path ultimately converges with that of Benno: Eric ends up directly in front of Benno's building on the very day that he loses his ability to read financial data, along with all of his material wealth, and Benno calls in a threat that he doesn't believe, but which is taken as credible (56). Moreover, by the time the two exchange a few gunshots and face each other across a table, with half a haircut, a torn pocket, no socks, a "crusty purple wound" on his head, and a foul smell emanating from his body, Eric more closely resembles the homeless, unemployed Benno than a multi-billionaire (188, 57).

As Eric wonders how he ended up in this situation, he attempts to answer his own question: "The yen. I couldn't figure out the yen [. . . .] I couldn't chart the yen" (190). And it is here that Eric once again mirrors Benno: when he was a currency analyst, Benno worked on the Thai baht, which collapsed in 1997.[37] As Benno confesses to Eric: "I loved the baht. But your system was so microtimed that I couldn't keep up with it. I couldn't find it. It's so infinitesimal" (191). Like Benno with the baht, Eric has been unable to chart the yen, and Benno explains where Eric went wrong:

> You tried to predict movements in the yen by drawing on patterns from nature. The mathematical properties of tree rings, sunflower seeds, the limbs of galactic spirals [. . . .] I loved the cross-harmonies between nature and data [. . . .] The way signals from a pulsar in deepest space follow classical

[37] For more information about the collapse of the baht, see "Ten Years On," *The Economist*, 4 July 2007.

> number sequences, which in turn can describe the fluctuations of a given stock or currency [. . . .] You made this form of analysis horribly and sadistically precise. But you forgot something along the way [. . . .] The importance of the lopsided, the thing that's skewed a little (200).

Harkening back to the foundations of technical analysis, Benno alludes to the perceived connection between natural laws, data, and mathematics, particularly the golden ratio. Benno points out that no matter how "precise" Eric attempted to make his system, he didn't (or couldn't) account for the "tics and quirks" of data and life (200). As Lorenz discovered, "[m]easurements can never be perfect," and the slightest change in input can vastly impact the output (Gleick 14–15). Moreover, Eric's own actions (continuing to borrow against the yen and subsequently affecting the data) contribute to his inability to read the market patterns, which even in the best of circumstances would be inherently unpredictable as part of a chaotic system.[38] Benno tells Eric that the answer he needed was "in [his] body," specifically in his asymmetrical prostate, a condition also shared by Benno (200).

For Benno, it wasn't just the yen that brought about this situation. He declares: "[e]verything in our lives, yours and mine, has brought us to this moment" (189). Although Benno doesn't "believe" the threat to Eric's life that he calls in, Torval, Eric's head of security, determines it to be "credible red. Highest order of urgency. This means an incursion is already in progress [. . . .] And now we have to act on what we know" (101). As strange as it seems, this assessment causes Benno's threat to become real. Benno explains, "[i]t is what people think they see in another person that makes his reality. If they think he walks at a slant, then he walks at a slant, uncoordinated, because this is his role in the lives around him" (57). Within this logic, which is not inconsistent with that of the quantum world, because Torval believes that Benno is an imminent threat to Eric's life, Benno is, in fact, an imminent threat to Eric's life. Consequently, Benno informs Eric, "I still need to shoot you [. . . .] there's no life for

[38] Joseph M. Conte also notes this phenomenon, stating, "[h]is leveraging of the yen has caused 'storms of disorder' in the currency market, and as chaoticians will attest, perturbations in nonlinear dynamical systems can have disproportionate and unpredictable effects" (189, internal citations omitted).

me unless I do this" (201). For Benno, the only way to regain his singularity is to kill Eric who has infiltrated every particle of his being, to the point that, as some have noted, it becomes difficult to tell who is speaking in this final scene because even the text's pronouns appear to be entangled (Silverblatt, "Don DeLillo (part II)").

As Eric looks away from "[t]he man who knew him in ways no one ever had" to his watch, which also has a screen and electron camera, he notices that it "wasn't showing the time," eventually discovering that "the image on the screen was a body now, facedown on the floor" (204, 205). As he looks up, around the room, and at Benno, seeing no body, Eric goes beyond Einstein, acknowledging the existence of parallel worlds and wondering: "Whose body and when? Have all the worlds conflated, all possible states become present at once?" (205). Ultimately, however, Eric realizes what he is observing: "O shit I'm dead" (206). But, similar to the White Queen who remembers things before they happen, Eric does not appear to be particularly disturbed by this revelation, thinking as "he closes his eyes one more time," "[t]his is not the end. He is dead inside the crystal of his watch but still alive in original space, waiting for the shot to sound" (209). Eric's narrative ends in a liminal state with him suspended between his present and the ruins of his future.

The physical point at which Eric and Benno converge complements this ambiguous ending. DeLillo chose 47th Street because it contains the political and economic history of New York (Silverblatt, "Don DeLillo (part I)"). Eric begins on 1st Avenue, near the United Nations, then travels past investment banks, the Diamond District, Times Square, the Theater District, and Hell's Kitchen only to end up in "a kind of wasteland of old junked automobiles and abandoned buildings" on 11th and 12th Avenue (Silverblatt, "Don DeLillo (part I)"). Throughout *Cosmopolis*, Eric represents the evolutionary pinnacle of American dot-com capitalism, epitomizing the "dramatic climb of the Dow and the speed of the internet [that] summoned us all to live permanently in the future, in the utopian glow of cyber-capital" ("Ruins"). He also embodies its fall and, significantly, as Eric travels west his empire declines. There is another layer of meaning in this directionality, as DeLillo explains, "in Egyptian lore, you live on the east bank of the river and you die and are buried on the west

bank, where the sun goes down" (Silverblatt, "Don DeLillo (part II)"). Yet, once again, symmetry comes into play. While Eric lives on East 47th and meets his end on West 47th, he actually lives on the west bank of the East River and seemingly dies on the east bank of the Hudson River, near where Benno lives. Looked at one way, westward the course of empire takes its way and the Icarus figure of Eric Packer comes crashing back to earth and back to the past; looked at in another, the off-grid, derelict Benno is about to journey East toward the world city represented by the United Nations.

In his *Chicago Sun-Times* interview, DeLillo observes: "I did a curious thing at the outset [of writing *Cosmopolis*], something I've never done before. I resolved to do tighter sentences. Sentences without dashes. Not to use analogy and metaphor to the extent I used to" (Barron). Although he claims that he did this "sheerly for the sake of writerly discipline," in the aftermath of an event that "has no purchase on the mercies of analogy or simile," the stylistic choices of *Cosmopolis* are significant, especially in light of its dominant scientific themes: as chaoticians have noted, "[s]imple systems give rise to complex behavior" (Barron; "Ruins;" Gleick 304). Moreover, in *Cosmopolis*, like *Ratner's Star*, the characters may seem like they are "barely corporeal cerebral entities," but they are "intentionally flattened and cartoonlike" (Kim; DeCurtis 59). This is because, similar to DeLillo's earlier work that focused on pattern and order, the "structure of the book *is* the book" (DeCurtis 59). Set on the on "the last day of an era" between the Cold War and the age of terror (Barron) in a text that was, itself, written in between pre- and post-9/11, the symmetrical form of *Cosmopolis* mirrors this pivotal moment. East or west, past or future, us or them—it all depends on one's perception, suggesting a parallel between the entwined existence of Eric and Benno and the world after "the huge antenna [fell] out of the sky, straight down, blunt end first, like an arrow moving backwards in time" ("Ruins").

That said, concluding that contemporary experience is indeterminate and relative may seem like a passé postmodern preoccupation, especially when postmodernism is finished and has been (supposedly) since the 1991 Stuttgart Conference (Burn 10); or, if it did not meet its demise then, it definitely did on September 11, 2001. And then again, maybe not. As Burn notes, pinpointing postmodernism's end

is nearly as problematic as defining it: in fact, one might say that postmodernism has seemingly been over from the time that it began (whenever that was). Dating postmodernism's death is further complicated by the fact that so many "postmodern" authors are still alive and publishing, including Thomas Pynchon (age 78), Robert Coover (age 83), John Barth (age 85), William H. Gass (age 91), and DeLillo (age 79). As such, quantum physics may seem like an old-fashioned approach, but it, too, is far from exhausted. Each new discovery, from the Higgs boson to Einstein's gravitational waves, provides DeLillo with an opportunity to update his ideas on subjects that have captured his imagination for decades—like math, science, time—and grants us a chance to reassess the ways that we understand his worlds, and ours.

Competing Interests

The author declares that they have no competing interests.

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