# The Chudnovsky Case: How Literary Journalism Can Open the "Black Box" of Science

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*Literary journalism offers an important way for explaining the complexity of the scientific world to a lay audience.*

In Bruno Latour's *Science in Action*, the French sociologist of science examines *The Soul of a New Machine* by literary journalist Tracy Kidder, exploring how it makes comprehensible the complexities of science to the lay reader. It is not difficult to see why Kidder provided an exemplar. Because for Latour, one way—and to him a better way—to understand science, as well as discuss it, is to understand how it is "made," e.g., its methods, the evolution of a theory across the years, the negotiations to gather funds for research, in other words, to focus on the various parts and processes that go into its making:

> In spite of the rich, confusing, ambiguous and fascinating picture that is thus revealed, surprisingly few people have penetrated from the outside the inner workings of science and technology, and then got out of it to explain to the outsider how it all works. . . . Other people talk about science, its solidity, its foundation, its development or its dangers; unfortunately, almost none of them are interested in science in the making. They shy away from the disorderly mixture revealed by science in action and prefer the orderly pattern of scientific method and rationality.[1]

The statement, with its emphasis on the "making" of science, is useful for analyzing the following:

> David dialed a mail-order house in Nevada that here will be called Searchlight Computers. He said loudly, in a thick Russian accent, "Hi, Searchlight. I need a fifteen-forty controller. . . . No! No! No! I don't need anything else! Just the controller! Just a naked unit! Naked! How much you charge?. . . Two hundred and fifty-seven dollars?"
>
> Gregory glanced at his brother and shrugged. "Eh."
>
> "Look, Searchlight, can you ship it to me Federal Express? For tomorrow morning. How much?. . . Thirty-nine dollars for Fed Ex? Come on! What about afternoon delivery? . . . Twenty-nine dollars before 3 p.m.? Relax. What is your name?. . . Bob. Fine. O.K. So it's two hundred and fifty-seven dollars plus twenty-nine dollars for Federal Express?"
>
> "Twenty-nine dollars for Fed Ex!" Gregory burst out. "It should be fifteen." . . .
>
> "I'm going to call A.K.," he said. "Hi, A.K., this is David Chudnovsky, calling from New York. A.K., I need another controller, like the one you sent. Can you send it today Fed Ex?. . . How much you charge?. . . Naked! I want a naked unit! Not in a shoebox, nothing!"
>
> A rhythmic clicking sound came from one of the disk drives. Gregory remarked to me, "We are calculating pi right now."
>
> "Do you want my MasterCard? Look, it's really imperative that I get my unit tomorrow. A.K., please, I really need my unit bad." David hung up the telephone and sighed. "This is what has happened to a pure mathematician."[2]

The excerpt shows a revealing scene of the purchase of components for the supercomputer "m zero," constructed by the Chudnovsky brothers. By means of partial dialogue, we follow what David Chudnovsky says on the telephone and his brother Gregory's commentaries. In other words, the author shows the reader how the equipment was attained and the preoccupations involved: the Chudnovskys were urging for the quick delivery of the unit, but were short of money; alternative plans and bargaining were frequent and necessary survival measures to them, which ultimately reveal the making of science.

In line with Latour, our hypothesis is that the use of narrative resources to describe research and development processes constitutes a journalistic model that, while dissonant from the conventional, mainstream models of journalism, is one that operates under distinct principles that make science more accessible to the layperson. For that reason it should be encouraged. Indeed, the issue is urgent, given that we live in an ever-evolving world made more complex by science. If the worlds of science and the layperson are to

understand one another, then literary journalism provides an exceptionally promising means for doing so.

Based on the Latourian contraposition between science as a metaphorically inaccessible "black box" as opposed to an accessible science-in-the-making—i.e., a never-ending process whose conclusions are socially influenced and non-definitive—we discuss in this examination the role of literary journalism as a means for the public communication of science by analyzing two articles that were published in the *New Yorker* magazine, "The Mountains of Pi" and "Capturing the Unicorn," both written by Richard Preston, author of the excerpt cited above.

We will do so by examining, first, the challenges posed by explaining science to the lay reader, and then how the reader is engaged by the literary that takes place in the humanizing of the scientific processes, the subjects, and the reporter.

Of all human occupations, scientific research and technological development are among those that are undoubtedly the least accessible to the layperson—either because of a large gap between human culture, art included, and the so-called hard sciences, as pointed out by C. P. Snow,[3] or because its products and postulations are presented to the public deprived from vestiges of its construction.

Under the banner of a "science culture," there is a set of educational and communication practices that seek to reintegrate science into the public's common culture in the hope that it will become less alien. But as Jean Marc Lévy-Leblond points out, such efforts will be insufficient as long as non-scientists are still treated as disengaged lay people, who, as part of common practice, are just supplied with scientific information but not treated as recipients with an equal credibility level to confront science or try to have influence over it.[4] According to a "deficit model," the main objective of such a reintegration would be a kind of literacy by providing the public with an array of accessible knowledge, which would help them in understanding and accepting scientific lore.[5] Such a model also assumes that journalists involved in its activities are translators of science to the public, adapting its difficult language to a more palatable and even humorous one, instead of reporting scientific objectives and achievements.

More usually journalism loses its investigative logic by "extending the red carpet . . . under the feet of the scientist."[6] In a reverential way, the scientist—or astronaut, physician, engineer—is presented as the voice of lore, an unquestionable information source, not as a social agent whose affirmations and positions must be contested, verified, and compared to those of other individuals, as Silvio Funtowicz and Jerome Ravetz suggest

is necessary.[7] There are cases in which there is a high degree of uncertainty on the part of the reading public in relation to the methods of science, or where the non-scientific community is involved in a direct or indirect way because of its interests or the consequences of the research—e.g., genetic engineering, plant improvement, or environment-changing research. Thus, for these critics science should integrate into its reviews an "extended peer community," composed by both scientists and interested laypeople, that would have influence over scientific decisions—an attitude that journalists may also emulate in their reporting.

Among the communication models ranked by Jane Gregory and Steve Miller,[8] we understand that literary journalism is at least half way between the top-down diffusion model (in which at the top the authority of a scientist's voice is transmitted directly down to the "lay" public at the bottom, who are presumably unaware of scientific facts), and the web model (in which communicators and scientists interact in a complex and inter-referential way). Nearer to the web model, literary journalism may use digressions in time and space, and present non-academic knowledge or non-predominant points of view as counterpoints or even as the main voice of a text. Thus, literary journalism presents a change in what the news values of reporting science and technology have so often been, and would more fully engage scientific sources who are treated like characters with whom the lay reader may identify himself, experiencing their challenges, losses, and triumphs. Thus, facts from the life stories of scientists and non-scientists involved or affected by the research become more important than those involving simply end results of their work in what Gregory and Miller characterize as scientific "facticity":

> 'Facticity' is a good news value for science. Simply from the point of view of news style, news stories require six facts: who, what, where, when, why and how. Science can usually supply these. A good story needs facts; readers enjoy facts—but they have to be facts that are meaningful, or relevant, or consonant.[9]

Scientific facts, then, that are not meaningful, relevant, or consonant are only cold, inaccessible facts—or the inscrutable "black box" of science. This is where the "literary" comes in.

The richly textured rhetoric of stories like those of Preston are yet to be seen in our country, Brazil. Cristina Santos and Simone Bortoliero[10] have noted that science news in Brazil is focused on "immediate aspects,"[11] confirming Warren Burkett's point that journalism "prefers established facts" to science-in-the-making.[12] Having adopted a positivist-empiricist line of thought, the media and more specifically journalism in the conventional

model perpetuate and engage in the so-called "results mythology."[13] Results mythology means that science lore—as well as science journalism—places the emphasis on the end results, and not on *how,* or the process by which the scientist got there: who were the people who've done the work, their background, the steps they took, their difficulties and challenges, their competitors, the experiments that did not work, politics, and policy, etc. The problem, of course, is that the results mythology interferes with the explanation of scientific information. A number of problems derive from the results mythology. To speak of research, development, and innovation under the exclusive point of view of the scientific end product, the image of the reduced, impenetrable science arises: if there is no information on how it came to be, science, as Latour understands it, is still inaccessible.

Brazilian reporters have paradigms that came from the North American model based on the news lead and inverted pyramid structure, which emerged by the end of the nineteenth century influenced by the rise of the scientific spirit and the belief in scientific objectivity. The notion according to which journalism, because it is believed to be inherently scientific,[14] has the mission of investigating and presenting "truth" in an independent and neutral manner, ostensibly based on the empiricist method, makes science seem inherently a certification of such a truth. In news and features that have science as a main theme and focus, the problem deepens as the affirmations and actions of a scientific rhetoric are transferred to the public in a one-way direction. Because it is one way, such accounts are rarely contested or debated by the lay reader, giving birth to "science advertising,"[15] instead of an engaging humanizing view that journalism should emphasize.

By thinking of literary journalism as a communication model that differs from conventional, mainstream journalism, we can evaluate the conditions that it offers for the public communication of science and confirm if those are in fact improved in a narrative form. We may assume that the literary quality of the text is reflected not only in metaphors and poetic writing, but also in an expanded register of reality in which can be found, for example, dialogue, flashbacks, digressions—which cumulatively are called the "expansion" principle.[16] Such techniques are useful when writing on science, as they help to unveil the background of scientists and their research. To Franco Moretti,[17] such "filling" instruments[18] were the greatest contribution to literature by nineteenth-century realism, the movement that helped so much to bring the illusion of ordinary life to literary composition.

Because narrative is potentially so many layered, other factors can also be detected in the overall process of humanization that show the sources

as human beings who have their own triumphs and defeats, delights and anxieties, just by being depicted as characters who perform actions in a narrative frame—which Tom Wolfe[19] summarizes as constituted by the use of dialogue, scene-by-scene construction (the sequence of the scenes would constitute a plot), points of view, and description of "status details." These elements, he continues, come from social realism—whose novelty was to employ them in the portrayal of real people-based characters. Yet, they are at least as old as Homer's epics. The plot itself, as though it could follow many different paths, is fundamentally structured in the presentation of characters and the scenes,[20] some complication which would add tension to the narrative, a climax that would show the highest point of the complication, and then its resolution, which leads to the ending of the story. In other words, we are discussing the basic tropes and tools of telling a story whose purpose is to provide illumination for the audience, an ambition, once again, as old as the shamans who told stories around the fire in the pre-history of the Amazonian jungles, among other places. These, we would suggest, would also include the simultaneous occurrence or coincidence of events, the stakes at risk and competition, failures, the enjoyable moments, and parallel facts of the scientific enterprise involved in both stories. The result is a multilayered complexity long used by the storyteller to mimic the nature of reality, as opposed to the simplistic and reductionist style of conventional factual or objective journalism.

To understand that kind of complexity, this analysis will examine three kinds of humanizing—the attempt to share the experiences of other subjectivities—according to rhetorical techniques associated with literary realism. These are humanization of scientific processes, humanization of the characters, and the humanization of the reporter. It should be emphasized, however, that these are not necessarily mutually exclusive. In fact, they are often found intertwined to make for a complex—and literary—reading.

## THE CHUDNOVSKYS

Both articles analyzed here, "The Mountains of Pi" and "Capturing the Unicorn," were published in the American magazine *The New Yorker*, respectively on March 2, 1992, and April 11, 2005. They complement each other by dealing with the same characters, Russian mathematicians David and Gregory Chudnovsky. In the first piece, author Preston profiles the Chudnovsky brothers, who have constructed the supercomputer m zero for the purpose of calculating the number π up to two billion digits. The article examines such factors as the mathematical and computational search for the biggest precision of π, and the relationship of the number with humankind throughout history. Moreover, and important to the purposes of this

examination, the article explores the difficult process of construction and maintenance of the computer, and at the same time, the mathematicians not only as scientists but also as human beings.

"Capturing the Unicorn" functions as a sequel to "The Mountains of Pi." In it, Preston tells us how the Chudnovsky brothers, now working at the Institute for Mathematics and Advanced Supercomputing (IMAS), Polytechnic University of New York, apply computational mathematics in order to resolve problems in the digitalization of a set of Medieval tapestries for the New York Metropolitan Museum of Art; there remains the focus on humanization, while narrating the context and the stages of the capture and digital restoration of the images.

It should be noted that the procedures for the humanization of science and scientists are more present in "The Mountains of Pi," presented as a profile of the Chudnovsky mathematicians, while "Capturing the Unicorn" focuses on the description of the processes for the recovery of the tapestries. Nonetheless, the same kinds of humanizing strategies are at work in each.

The reason Preston's works are consonant to the current moment of literary journalism is that like much of literary journalism they explore what mainstream conventional journalism generally does not. While the latter routinely reports on politics, sports, and even science as reflected in the traditional top-down diffusion model, the Chudnovskys's research would hardly find prominence in newspapers, according to conventional news values: the calculation of π, or even the digital work on the Unicorn tapestries, does not offer direct, easily communicated results to society according to conventional models of journalism that require concise and specific prescriptions for writing. The result, all too often, is a simple and simplistic rhetoric inadequate to the task of revealing the complexities of science to the lay reader.

The narrative model presents a powerful rhetorical resource that may produce what Steven Shapin and Simon Schaffer[21] describe as a "virtual testimony," i.e., a depiction which "by means of a detailed description of equipment and experimental results, allowed its readers to imagine the experiences lived and to become themselves virtual witnesses of it."[22] This agrees with Latour's statement that "to put the academic paper aside and go to a laboratory equals abandoning an armory of rhetorical resources and go for a set of new [rhetorical] resources planned with the objective to offer to literature a more powerful instrument: visual exposition."[23] Thus, the actions depicted are no longer situated in an alien dimension, an Olympus of lore. The scientist becomes a common, even banal, person, whose procedures of work and way of life are revealed by the reporter. This was the premise behind the New Journalism to Tom Wolfe, "that rather elementary and

joyous ambition to show the reader *real life*—'Come here! Look! This is the way people live these days! There are the things they do!'"[24]. Or, as Norman Sims notes:

> Reporting on the lives of people at work, in love, going about the normal rounds of life, they confirm that the crucial moments of everyday life contain great drama and substance. Rather than hanging around the edges of powerful institutions, literary journalists attempt to penetrate the cultures that make institutions work.[25]

The "powerful institution" here is the inaccessible black box of science. By humanizing, what we mean, then, is the achieving through such linguistic illusion a virtual testimony in which readers imaginatively feel they participate, or which they participate in vicariously. Alan Trachtenberg called it "an exchange of subjectivities"[26] in his discussion of the literary journalism of the American writer Stephen Crane in which the reporter and reader understand someone else's subjectivity as if they were trading places with them.

## HUMANIZING SCIENTIFIC PROCESS

To achieve a virtual testimony on scientific process in the Preston stories, two of literary journalism's main resources, scene and dialogue, are utilized. By using them, the reader can vicariously watch researchers in action, interacting with themselves or with the reporter/narrator, in order to testify to the process of making science. For example:

> Gregory Volfovich Chudnovsky recently built a supercomputer in his apartment from mail-order parts. Gregory Chudnovsky is a number theorist. His apartment is situated near the top floor of a run-down building on the West Side of Manhattan, in a neighborhood near Columbia University. Not long ago, a human corpse was found dumped at the end of the block. The world's most powerful supercomputers include the Cray Y-MP C90, the Thinking Machines CM-5, the Hitachi S-820/80, the nCube, the Fujitsu parallel machine, the Kendall Square Research parallel machine, the nec SX-3, the Touchstone Delta, and Gregory Chudnovsky's apartment. The apartment seems to be a kind of container for the supercomputer at least as much as it is a container for people.[27]

This is the opening to "The Mountains of Pi." Aside from the obvious exposition of the main subject (the construction of the computer m zero), it contains perhaps more importantly a descriptive picture of the apartment where the computer was constructed, and a description of violence in the surrounding New York neighborhood that provides a backdrop for the Chudnovskys's science in the making. The violence serves as ironic counterpoint to the high technology world of the subject. Similarly, the parts

bought via FedEx, discussed earlier, provide further ironic counterpoint to the sophisticated scientific nature of the subject. Such ironies are important because they reveal just how lo-tech the making of science can be, or how ironically banal and even macabre are the surroundings in which such science takes place. Thus we begin to detect the accumulation of literary layers.

Such contrasts, mingling complexity with ordinary everyday experiences readers can expect to be knowledgeable about, continue:

> "And we have to build our machine because we have—"
>
> "No money," Gregory said. "When people let us use their computer, it's always done as a kindness." He grinned and pinched his finger and thumb together. "They say, 'You can use it as long as nobody complains.'"[28]

Throughout the narrative, intellectual and technological sophistication will always be in ironic counterpoint to the limited circumstances of the Chudnovskys. This is the stage where "science-in-the-making" is enacted, or human endeavor as process.

Similarly, science-in-the-making by means of *descriptive process* is detected in "Capturing the Unicorn": Before introducing the Chudnovskys in the narrative, Preston describes the work of the Metropolitan Museum of Art employees who attempt to photographically digitalize the images of the medieval tapestries, which portray the capture of a unicorn, only later to find that the images show a distorted tapestry. The result is that the Chudnovsky brothers are asked if they could find a solution by means of computation and applied mathematics:

> To make a digital image of the Unicorn tapestries was one of the most difficult assignments that [the manager of the photography studio at the Met, Barbara] Bridgers had ever had. She put together a team to do it, bringing in two consultants, Scott Geffert and Howard Goldstein, and two of the Met's photographers, Joseph Coscia, Jr., and Oi-Cheong Lee. They built a giant metal scaffolding inside the wet lab, and mounted on it a Leica digital camera, which looked down at the floor. The photographers were forbidden to touch the tapestries; Kathrin Colburn and her team laid each one [of the tapestries] down, underneath the scaffold, on a plastic sheet. Then the photographers began shooting. The camera had a narrow view; it could photograph only one three-by-three-foot section of tapestry at a time. The photographers took overlapping pictures, moving the camera on skateboard wheels on the scaffolding. Each photograph was a tile that would be used to make a complete, seamless mosaic of each tapestry.[29]

Such a narrative discloses, as narratives must, stages of the work the reader can follow as "science-in-the-making." It notes the potential risks, such as importance of not touching the fragile tapestries. Readers vicariously

become a part of those risks—following, for example, the progress of the skateboard wheels to which a Leica camera [the camera itself adding still another resonant layer considering that Leicas are widely regarded as some of the most sophisticated cameras in the world] is attached, and thus they follow the drama of the story. The reader also understands the importance of taking pictures of smaller "tiles" for the purpose of getting better photographic resolution.

Another method used in the disclosure of humanized science is when David Chudnovsky loses a bag of CDs containing digital images of one of the tapestries. In other words, readers become part of a crisis stage—or developmental action—in the narrative.

> David took the subway back to Brooklyn, stopping off at a supermarket to buy some fruit. In the lab, he put down his things, and Gregory began going through them. "Where are the rest of the CDs?" he asked David. One of the Metropolitan Museum bags was missing.
>
> "My God! I left it on the subway," David said.
>
> Half the Unicorn tapestries could have been anywhere on the B.M.T. They began frantically calling the subway's lost and found. "Naturally, there was no answer," Gregory recalled.
>
> David retraced his route. He found the Met bag sitting under the lettuce bin at the supermarket. Apart from being slightly misted, the CDs were O.K.[30]

Thus, one can point out that contingency, of which it can be expected that all human beings have had the occasion to experience, can also play a role—in this case a very dramatic role—for science-in-the-making. We are watching, then, a scientific researcher who is imperfect and incautious just as all human beings can be imperfect and incautious. As Latour notes, "to understand what facts and machines are is equal to understanding who people are. One who is able to describe the controlling elements that had been gathered will understand the groups that are controlled."[31] This is what readers can relate to because to understand the factors that impose limits on the development of scientific activities allows for understanding why they happen in certain ways.

## HUMANIZING THE SCIENTIST

If one of the main barriers between the scientific sphere and common culture is the distant image that "lay" people have of researchers,[32] it is necessary to challenge the mythology that somehow scientists are supermen. It is certainly suggested in the example above about the lost CDs because it reveals how David, while looking at lettuce, is absentminded. In other words, it can be accomplished by focusing on scientists as people of complex

composition, thus opening another type of black box and disclosing who such men are, how they behave among themselves and their families, if they have illnesses, glories, dishonors, what cheers them up or infuriates them, if they have altruistic or egoistic interests; in other words, what makes them complex humans to which readers—who are also complex humans—can relate? Again, this recalls Wolfe's and Sims's prescriptions for invoking social realism. Such is the case with Gregory Chudnovsky in the following character description:

> Gregory Chudnovsky is thirty-nine years old, and he has a spare frame and a bony, handsome face. He has a long beard, streaked with gray, and dark, unruly hair, a wide forehead, and wide-spaced brown eyes. He walks in a slow, dragging shuffle, leaning on a bentwood cane, while his brother, David, typically holds him under one arm, to prevent him from toppling over. He has severe myasthenia gravis, an auto-immune disorder of the muscles. The symptoms, in his case, are muscular weakness and difficulty in breathing. "I have to lie in bed most of the time," Gregory once told me. . . . He spends his days sitting or lying on a bed heaped with pillows, in a bedroom down the hall from the room that houses the supercomputer.[33]

In describing the characters, we have characterization of the kind so often associated with traditional fiction except that it is not fiction; the reader has an image of Gregory Chudnovsky—a virtual testimony—and can take notice of the ironic contrast between his scientific sophistication and his relation with his immediate environment. The environment reveals more about him when he is in the presence of his daughter.

> Gregory Chudnovsky was half lying on the couch, in his stocking feet, his body extended, facing the figure of Melancholy [Albrecht Dürer's engraving]. His shoes, which were tucked inside surgical booties, had been left on the floor. He wore jeans and a soft leather jacket, and he seemed relaxed. Christine and Marian, who is five, were there. Marian was chattering and running around the lab happily. The effect of the child circling over her father's swirling equations was slightly vertiginous.[34]

The incongruity of the five-year-old child with the remote and sophisticated scientist is, of course, ironic, if not paradoxical. But it's an incongruity that must humanize the scientist. After all, he is also a parent, and that is something much of an adult population can relate to.

Moreover, Preston discloses some of the family dynamics. With an ill brother, an aged mother, and the supercomputer, we find that all require special care and constant maintenance: "David spends his days

in Gregory's apartment, taking care of his brother, their mother, and m zero."[35] The equivalent might be Einstein taking care of his mother when she was ill, feeding her chicken soup perhaps while she had a cold, an image one does not normally associate with such an esteemed scientist.

In another example, "Gregory's bedroom is filled with paper; it contains at least a ton of paper. He calls the place his junk yard. The room faces east, and would be full of sunlight in the morning if he ever raised the shades, but he keeps them lowered, because light hurts his eyes."[36] The example serves two purposes. First, it reveals the vulnerability of the scientist because of his eye problems. Second, the room's description provides Wolfean status detail because scientific activity results in accumulations of seemingly endless volumes of paper. The "junk yard" metaphor is still another reflection of the man Gregory Chudnovsky.

We also see a rapprochement between "m zero" and Gregory Chudnovsky in which both, as characters, share some things in common: To remain relatively healthy, both must be kept in a closed environment and, due to financial limitations, not an acclimatized one, but a hot, sultry, dark, claustrophobic one:

> Waste heat permeates Gregory's apartment, and the room that contains m zero climbs to a hundred degrees Fahrenheit in summer. The brothers keep the apartment's lights turned off as much as possible. If they switched on too many lights while m zero was running, they might blow the apartment's wiring. Gregory can't breathe city air without developing lung trouble, so he keeps the apartment's windows closed all the time, with air-conditioners running in them during the summer, but that doesn't seem to reduce the heat, and as the temperature rises inside the apartment the place can smell of cooking circuit boards, a sign that m zero is not well . . . . The building superintendent doesn't know that the Chudnovsky brothers have been using a supercomputer in Gregory's apartment, and the brothers haven't expressed an eagerness to tell him.[37]

Not only do the brothers not tell the building superintendent, they hide from him that m zero is installed there because the supercomputer's demand for energy could pose a wiring risk. Thus the ethically suspect behavior reveals just how all too human they are. After all, how many people have not engaged in such lapses in the interests of what they believed was a more important cause? Such an awareness that science and scientists's acts might bring social risks is something any reader can relate to. After all, who has never experienced a power outage?

Such details also reveal the scientists's passion for what they do. And passion, of course, is a human impulse: "To them, numbers are more

beautiful, more nearly perfect, possibly more complicated, and arguably more real than anything in the world of physical matter."[38] From there can be deduced the absence of a necessity for finding practical purposes in research; what moves them on is not only scientific curiosity but more broadly human curiosity. Who has never had a passion in life that was not "more beautiful, more nearly perfect, possibly more complicated, and arguably more real" than anything else, whether a member of the opposite sex, a child's love for a kitten or puppy, or an old man's passion for playing chess, or restoring antique cars, or feeding pigeons?

As noted, even technology—the result of human ambition, passion, and sometimes hubris—is humanized, or personified, and personification is an ancient literary strategy at least as old as the Greek poet Homer when he described the "rosy fingers of dawn" that generations of university students had to study in *The Odyssey*. M zero is personified in the following: "Once again, pi has demonstrated its ability to give a supercomputer a heart attack."[39] It runs the risk of ill health like its master Gregory, and, as noted earlier, it is part of the family. Treating it as a character—personifying it—has humanized it in such a way that it is less complex for the reader to understand. The heart attack metaphor makes it less "frightful," equalizing it to humans in regards to human fragility.

Pi, which exists only as an abstraction, is personified as well. As Gregory Chudnovsky observes, Pi looks "monstrous" to him, and he characterizes as "gibberish" the results of its calculation. "We know absolutely *nothing* about pi," he declared from his bed. "What the hell does it mean? The definition of pi is really very simple—it's just the ratio of the circumference to the diameter—but the complexity of the sequence it spits out in digits is really unbelievable. We have a sequence of digits that looks like gibberish."[40] And it is of course humans who engage in the nonsensical language of gibberish. Moreover, because the creature is monstrous, Gregory sees the science he is producing as something frightful. This raises the question: Won't lay readers also feel that haunting feeling before what is still inexplicable? Herein is what joins Gregory and readers. π is an incognita for *both* readers and scientists: by identifying ourselves with them and sharing their amazement, a further mutual humanization is achieved.

## THE HUMANIZATION OF THE REPORTER

In both articles, Preston is not a mere narrator-observer, but a participant in the subjects's lives, whose presence instigates and makes them react to it. For example:

> Gregory said, "Our knowledge of pi was barely in the millions of digits—"

> "We need many billions of digits," David said. "Even a billion digits is a drop in the bucket. Would you like a Coca-Cola?" He went into the kitchen and there was a horrible crash. "Never mind, I broke a glass," he called. "Look, it's not a problem." He came out of the kitchen carrying a glass of Coca-Cola on a tray, with a paper napkin under the glass, and as he handed it to me he urged me to hold it tightly, because if a Coca-Cola spilled into—He didn't want to think about it; it would set back the project by months.[41]

Instead of "editing" the dialogue and giving it an uninterrupted logical sequence—discussion concerning the need of calculating π with more and more digits—Preston shows us how being offered a soda to himself intervenes with the interview and modifies the scenery and its characters. In effect, we see again ironic contrast as the almighty and "monstrous" mathematical equation π has to compete with Coca-Cola and a glass breaking for the attention of the reader. Symbolically, the almighty and the monstrous have been reduced to a commonplace, a banality that anyone can understand. And this, all because of the unintended intervention described by the narrator.

Another example of Preston's involvement is presented in "Capturing the Unicorn" when he takes his family to the Chudnovskys's laboratory at IMAS. Everyone there must wear boots in order not to damage the floor; besides the risk of intervening in the environment if the rules are not followed, there is the involvement of the reporter with his sources because their respective families are visiting each other.

Certainly one of the most effective instances of the humanization of the reporter is when the roles are reversed and Preston finds himself the interviewee. This comes as close to a true "exchange of subjectivities," again as Trachtenberg characterized it, as one can expect:

> I asked the brothers when they planned to build their supercomputer.
>
> They burst out laughing. "You are sitting inside it!" David roared.
>
> "Tell us how a supercomputer should look," Gregory said.
>
> I started to describe a Cray to the brothers.
>
> David turned to his brother and said, "The interviewer answers our questions. It's Pirandello! The interviewer becomes a person in the story." David turned to me and said, "The problem is, you should change your thinking. If I were to put inside this Cray a chopped-meat machine, you wouldn't know it was a meat chopper."[42]

As observed by David Chudnovsky, we have a Pirandellic moment here: Just as characters that leave paper-life to assume an independent role in

*Six Characters in Search of an Author*, by Luigi Pirandello, here the observer's opinions are disclosed and contested by the interviewed. Acting as a character also subject to verification and review, Preston turns his journalistic discourse into an acknowledgment of his own imperfect humanity. Fundamentally, he is non-authoritarian, and the subjects of the article, the author, and vicariously the readers, are all engaged in a discussion as equals, thus making this a communal or shared narrative.

Moreover, at the end of "Capturing the Unicorn," Preston revisits the Unicorn tapestries at the museum. Here, once again, the journalist participates, and in doing so the reader who has come to accept Preston as part of the story becomes part of it, too. They become, in effect, co-equals. In this instance, Preston expresses his admiration for the original fabric tapestries, considering them more interesting and emotionally provocative in three-dimensional form than in the digital version, even though the original was reproduced inch by inch. His is, then, a return journey from the lofty considerations of science to the phenomenal or material world with which the lay reader is more familiar:

> One day, I went to see the Unicorn tapestries in the physical universe, as distinct from the universe of numbers. It was a quiet winter afternoon at the Cloisters. The gallery where the tapestries hang was almost deserted. When I looked at them, each flower and plant, each animal, each human face took on a character of its own. The tapestries were full of velvety pools and shimmering surfaces, alive with color and detail. In the fence that surrounds the captive unicorn, tarnished silver, mixed with gold, gleamed in the grain of the wood. In comparison, the digital images, good and accurate as they were, had seemed flat. They had not captured the translucent landscape of the Unicorn tapestries, as the weft threads dive around the warp, or the way they seemed to open into a world beyond the walls of the room.[43]

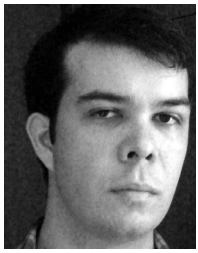
What we see is a Benjaminian rejection of the technically reproduced artwork. Just like the German critic and philosopher associated with the Frankfurt School, Walter Benjamin, Preston here attributes some "aura" to the original artwork, which its mediatized, 2-D version could not reproduce. In the context of science reportage, what we see is an important counter voice: In spite of the high technology in cameras and computers, there is a set of tapestries whose materiality constitutes a non-substitutable presence. The reporter also shows that even if he writes mainly on science and technology he does not want to depict them as having an ontologically miraculous or totalitarian power, or for that matter an epistemologically totalizing power,

holding sway over society and culture. In effect, he wants to assure the lay reader that the "black box" of science remains open to examination.

## CONCLUSION

Our hypothesis is that the main goal of literary journalism about science is to depict science-in-the-making.[44] Latour notes that by knowing the formative processes that arrive at scientific facts, even "lay" people can discuss such complex subjects. Therefore, by telling a story in this manner one can open the "black boxes" by means of exhibiting the work and negotiation processes. In effect, Preston allows the readers to engage in their own critique. By presenting himself as both an inquiring journalist and as a character in his own story where he is actively participating and involved with the sources, he does not impose a scientific "truth." Rather, it's up to the readers to decide how true the science is.

Nor does Preston objectify the scientists as inaccessible. Rather, they all share in the imperfections and contingencies of life. The literary factor in Preston's works places the readers as guests invited to enter the Chudnovskys's home, to visit their mother, to enter the room and meet the personified m zero. The readers can see the activity of research and development—scientists in action, the making of science, along with the people who surround them and other social aspects with which they are associated—as well as the human condition of the portrayed characters. Thus, like any good literature, there is a philosophical dimension here when we consider the broader implications. But more to the point of this paper, the reader of these kinds of articles may be more apt to understand better the nature of science, and to make use of more instruments to evaluate it, to support it, or to contest it when he or she has finally been permitted to enter the "black box" that for so long denied entry.



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