

## The theater of the infinite

By Lee Smolin

*“Our insatiability condemns us forever to seek the infinite from the finite”*

-Roberto Mangabeira Unger, *The Religion of the Future*. p 271.

The story that we tell is that there has been art and science for as long as we have been human. And I am inclined to believe it, as there is evidence for it. We've been painting on cave walls for at least 20,000 years and we could have been painting on other less well-preserved surfaces for much longer. The cave paintings don't look like the work of beginners. Of course, reconstructing the past is hard and the intense curiosity we feel for our origins tempts us to give in to fantasy and projection. An iconic *New Yorker* cartoon shows a female cave painter queried by her apprentice, *“Does it strike anyone else as weird that none of the great painters have been men<sup>1</sup>?”* And indeed, here we face the limits of knowledge of the past, for how will we ever know?

The same caves yield bones on which patterns of lines have been carved. As first reported by Alexander Marshak, these recordings come in groups of 7, 14 or 15, 28 or 29. Marshak took this to be evidence for early astronomers tracking the lunar cycle, but he never mentioned an obvious and equally plausible interpretation according to which our cave painting ancestors practiced contraception. And, indeed, how will we ever know which interpretation of the past is right? It is even possible that they were trying to work out a reason for the coincidence of those two cycles—a legitimate and open question to this day.

I would love to know what these early scientists talked about with the early artists, as they sat around the fire, drinking early beer. I suspect that then as now a lot of it was gossip—but did they also wonder about their origins, or their future? Could they have put their heads together and imagined us? For, the paleontologists tell us, we are the same creatures as them. All that separates us is 800 generations of progress in art and science.

I like to think of scientists and artists as explorers of our common future, laying down tracks in the domains of nature and the imagination. In addition to these two frontiers, our future is marked by the frontiers of society and of spirituality; these are the domains of politics and religion. These four domains and those who explore them have a special and permanent place in human society.

When the explorers of these four frontiers are in conversation, our culture has a chance to grow coherently into the future. When, as now, physicists have no idea what biologists talk about—let alone what the issues are on the frontier of painting or

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<sup>1</sup> <http://imgc-cn.artprintimages.com/images/P-473-488-90/61/6150/PXCG100Z/>

photography—the culture is incoherent. This is not to mention the opportunities for progress we are missing when the practitioners of the great religions regard each other as terrorists to be feared rather than brother and sister seekers to learn from. Indeed, it is impossible to know how people in a century or two will think of us, but my best bet is that ours will be known as the era of missed opportunities.

For the last century we have lived in a culture in which everyone wants to be an artist-or at least live like one. College students dress in informal fashions pioneered by the artists who worked in Paris in the early 20th Century or Soho and Tribeca in the 1960's and 70's, when those neighbourhoods were the domain of poor artists squatting in converted industrial space. Now their lofts are the homes of lawyers and investment bankers, never mind that the spaces themselves—a single wall of windows facing a dark cave - may have made great painting studios but are awkward to arrange as an apartment in a city whose building code requires that every bedroom have a window.

But the fashion is changing, for now geeks are cool. It is possible to imagine that soon everyone will want to live the life style of a scientist or engineer. That will certainly be convenient for the corporations of the world, because we geeks work all the time. At some software companies there are technical updates posted strategically in the bathrooms, so as not to lose those private minutes to private thoughts. There was a time the best jobs came with an expectation of being able to take long alcoholic lunches and leave work for golf or a sail at 3pm. Now the coolest jobs available to recent grads are patterned on the lives of obsessive, pale MIT graduate students, who never leave the limits of the infinite corridor.

At this moment then, there is a special poignancy when artists seek to portray the lives of scientists. Sometimes this is just a very contemporary form of camp, as in the attractively dressed young female scientists who have become a staple of bad movies and television series, who squint seriously while they come up with the idea that saves the day, but never seem to encounter the real issues that face women scientists in the still male-dominated scientific workplace.

But occasionally an artist attempts a serious portrayal of science. Theater seems to offer an opportunity for this, which has been taken up in recent years by Michael Frayn's *Copenhagen*, David Auburn's *Proof*, Steve Martin's *Picasso at the Lapin Agile*, and Allan Alda's portrayal of Richard Feynman in Peter Parnell's play *QED*. This last year we had films about Alan Turing and Stephen Hawking.

Last year, I was extremely fortunate to be asked to advise on the production of a truly great new play about scientists: Hannah Moscovitch's *Infinity*, produced by Ross Manson's Volcano company, which premiered this past spring at Toronto's Tarragon Theatre. *Infinity* is a three-character play, about a violinist and composer who marries a theoretical physicist and has a daughter who grows up to become a mathematician. It had 45 sold-out performances and won the Dora Mavor Moore Award for best new play of the Toronto season.

Seven years ago Manson commissioned Moscovitch, who was at the beginning of a rapidly ascending career, to write a play about time, for him to direct. For five years they developed the play in workshop with a quartet of top-notch performers (four because the composer's music (composed by Njo Kong Kie) is played by the violinist Andréa Tyniec, while her character is portrayed by the actor Amy Rutherford). At some point they got a hold of my book *Time Reborn*, and Manson asked me to meet with Moscovitch and advise her and the company on the production.

I am the son of a playwright, Pauline Smolin, so this was an invitation I respected and appreciated. I had grown up partly in the theatre world; my first play was when my mother took me to see Joseph Papp's *Medea* as part of Shakespeare in the Park, when I was perhaps five.

Meeting Hannah Moscovitch was a privilege and a thrill. Smart, quick-witted, charismatic, and kind, she probed my ideas on time and how we physicists live during a coffee that stretched for hours and continued in email correspondence.

Months later, the director invited me to a reading, which took place on a cold and icy Toronto winter's day. I was stunned by the play, and the cast members, who were each strong. Afterwards the assistant director noticed I needed a hair cut and immediately produced scissors and gave me one. This is something that would never happen in a physics department. There is no avoiding the fact that it is way more fun hanging out with theater people than physicists. As Manson said at one point, "Everyone in this production is brilliant," and there is—and, I suspect, has been for 20,000 years—nothing like the company of smart artists.

Moscovitch's play is about the great gulfs between the past, present, and future. It is about how the past is unrecoverable while, at the same time, it molds us. We can't know what our parents said to each other when they met, but their history is, to a larger extent than we can easily admit, our future. It is about how time shapes us as lovers, spouses, and parents, and the children of those parents. And it is also about the idea of time, as it is understood by musicians and physicists.

In turn I invited the company to spend a day at Perimeter Institute for Theoretical Physics, where I work. The actors who were to play the physicist and mathematician, Paul Braunstein and Haley McGee, watched us like hawks. Amy Rutherford remarked to me how attractive and charismatic she found the people she met, with their evident intelligence and focus. The designer, Teresa Przybylski, queried our peculiar dress habits. Months later when I saw the opening it was clear they understood us. Physicists can recognize each other across an airport, as can mathematicians, and their characters would pass.

Somehow Moscovitch caught precisely our particular intensity. Her mathematician has all the quirky literalness and childlike inappropriateness of the best of those I've met. And she gets in trouble in ways common to smart academics.

One of the truest moments comes when Carmen, the musician, confronts her husband, Elliot, the physicist, who has left their bed at 3 am to work.

“ELLIOT: Listen, I’ll stop now, I’m finished my...PhD—and I will...stop now, I said I would and I...meant it when I said it.

CARMEN: Yeah?

ELLIOT: Yeah.

*Beat.*

CARMEN: *Can you stop?*

ELLIOT: Yes.

CARMEN: Can you?

*Silence as ELLIOT considers the question.*

Can you?

ELLIOT: (*shrugs*) Maybe...maybe...look, maybe...? I don’t know—I don’t know: yeah, I...don’t know. I like to work, it yeah – it gives me something – I have this sense that I can contribute something that’s...substantial and I want to—I don’t know, sometimes, it almost surfaces. And my PhD was...I did feel relief, and I...know the department was... happy with it, but I don’t think I went far enough with it—

CARMEN: You unified string theory and loop quantum gravity / using—

ELLIOT: I—yes—I know fine, good, yes, it’s clever but it’s limited. Like I can’t broaden my...I have this sense that it’s just out of reach, I don’t know it’s...bothering me, it’s... and I feel like if I keep going, I’ll get there.

*Beat.*

And that thought, it’s...not leaving me alone.

*Beat.*

(*hesitating*) Yeah...

*Beat.*

In my worst moments, I...yeah, I think about my colleagues who don't have a family, they publish more, but I wanted a family, I wanted you to have Sarah Jean, but of course, of course in very fleeting moments I think about those colleagues, and how they go home to houses that are...quiet, and how they get more published

*Beat.*

I—yeah—if I'm being—if I'm being...very—I *do* still have something to...prove.

*Pause.*

CARMEN: Elliot?

ELLIOT: Yeah?

CARMEN: You know that when I talk to the secretary of the Physics Department she tells me that they've never had a PhD candidate who's as talented as you in the whole time she's been the secretary—which is thirty-seven years.

*Beat.*

Did you know that?

*ELLIOT nods.*

It...doesn't make it...better?

*ELLIOT shakes his head.*

ELLIOT: No.

CARMEN: No, hunh. <sup>2</sup>

Michael Frayn's *Copenhagen* is also a well-written three-hander. I saw the play in London and, while the characters on the stage were called Niels Bohr and Werner Heisenberg, they were not physicists. They were at best professors of English or History at Cambridge. Moscovitch's characters are us.

They are at the same time very much her characters. Moscovitch's Elliot is not me, and his problems, as the play reveals them, are, thankfully, not mine. But, most remarkably, during the course of the play he changes his mind about a key question that faces contemporary physics, which is the nature of time. And his change of mind is exactly one I made over the last decade, which led to my writing *Time Reborn*.

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<sup>2</sup> Hannah Moscovitch, *Infinity*, 2015, used with permission.

The question at the heart of physics is whether time, particularly the present moment and its place in a flow of moments, is fundamental or an illusion. Einstein and most theorists since see time as an emergent, reducible concept. What is real, they claim, is not the present moment, but the whole history of the universe, taken as one, as a single timeless entity. Within this frozen history, there is no fundamental difference between past, present, and future. All three are equally present in the frozen “block universe,” so the difference is just a matter of perspective; “then” and “now” are no different than “here” and “there”.

For reasons that I had explained in *Time Reborn*, and in my book *The Singular Universe and the Reality of Time*, with Roberto Mangabeira Unger, I have come via a long, painful process to reject this received wisdom in favor of the view that time is fundamental. This view asserts that what is real is the present moment, and the processes of change and causation lead to the creation of the new moment out of the present.

In *Infinity*, Moscovitch captures not only this change of mind as an intellectual process, but its implications for the character and his understanding of his life, as a scientist as well as a husband and father.

I had tried to express these personal implications of our conception of time in the epilogue of *Time Reborn*. There I wrote that our conception of time shapes how we understand society’s greatest challenges, such as climate change, as well as our most personal struggles, with parenthood, anxiety, ambition, and responsibility. In a short play, Moscovitch communicated these insights much better than I had been able to. Each time I saw the play I was shocked and moved.

Towards the end of the creative process, Moscovitch and Manson asked me to supply Elliot’s scientific biography, which they used as the backstory for the final version. So, with their permission, I attributed to Elliot achievements that I at one time aspired to, and still do, but which for now remain unrealized hopes, like the unification of string theory with loop quantum gravity (which became his PhD thesis). But it was completely Moscovitch who understood that the issue of whether time is real or illusion is at once a pressing scientific problem, a question a composer must address, and a question for all of us professionals who also aim to be good parents, who love both our children and our work. She portrayed the inner conflict felt by those who are drawn by our passions and loves to each other, while at the same time drawn away from each other by other passions and loves we imagine are timeless.

And she also understands that time is a central problem for art to resolve at this confused moment, when modernism has given way to postmodernism. That is, a pretense at timelessness has been replaced by a pretense of ephemerality. This, in turn, is giving way to novel ways to communicate the truths we live out, as we struggle with the same questions those first artists and scientists talked over, back when the

possibility of representing an animal in flight with some pigment brushed onto a rock was shocking and new.

**Bio:**

Lee Smolin is a theoretical physicist who is engaged in a lifelong search for the quantum theory of space and time. He is best known for his contributions to the approach known as loop quantum gravity. His research interests include cosmology, elementary particle theory, the foundations of quantum mechanics, and theoretical biology. Dr. Smolin was named as one of the 100 most influential public intellectuals by Prospect and Foreign Policy Magazines in 2008 and again in 2015.

Born in New York City, and educated at Hampshire College and Harvard University, he moved to Canada in 2001 to be a founding faculty member at Perimeter Institute for Theoretical Physics. The author of 180 research papers, his last two books are Time Reborn (2013) and, co-authored with Roberto Mangabeira Unger, The Singular Universe and the Reality of Time (2015).

His previous theatre credits include dramaturg for “Background Interference” by Drucilla Cornell, West Beth Theater Center, NYC and advisor for productions of “Galileo” and “A Walk in the Woods” at Yale Rep. Theatre and Yale Drama School. He also advised, and acted in, a film, “Soma Sema”, directed by Madeline Schwartzman. He previously wrote on this theme in an 2005 essay, “Art, Science and Democracy”, written for the catalogue of an exhibition of the sculptor Elizabeth Turk, Contemporary Arts Center, Santa Barbara, California.