

# Gravity on Stage: A Dynamic Confluence of Theatre, Einstein and Dance

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I want to thank Brian and Linda for this generous invitation and to all of you for your kind welcome.

I grew up in a musical family – my father was a conductor, his brother was the classical singer William Warfield who was married to opera singer Leontyne Price; I started piano at age 4, was studying to be an opera singer then became a ballet dancer and later modern dancer. Performing arts has been part of my life from early on. And so the experience of creation and creating has played and continues to play an important role throughout my development.

As someone mentioned yesterday, it was Albert Einstein who said, “Imagination is more important than knowledge.” I would suggest imagination is a form of knowledge, an intuitive knowing, a wisdom and an intelligence often not readily visible or accessible within the qualitative reasoning framework. But venturing outside that framework anything is possible. The scientist and the artist share the experience of imagined possibilities.

I am on the faculty of the National Technical Institute for the Deaf, a college at the Rochester Institute of Technology in Rochester, New York. In addition to teaching dance courses I also teach a course combining social science and creativity called: Individual and Social Identity. I’m the director of a unique dance company at the college comprised of deaf, hard of hearing and hearing students from all levels of dance experience. What has interested me over the years has been not merely the exploration and widening of the definition of dance but more specifically why we are compelled to move and explain our human experience through this movement language this visible language we create. I’ve used American Sign Language as inspiration for dance, made dances in water; I’ve even choreographed street sweeping trucks in a dance (<http://www.youtube.com/user/ARTWalkArchive#p/u/33/oOvgnAJMztY>)

But a couple of years ago I met with a research scientist in the gravitational astrophysics program at RIT. She explained to me, somewhat in laymen’s terms, her research in the field of gravitational physics and in particular the study of black holes in space. Though I’ve spent most of my professional life as a performing artist science isn’t totally a foreign language. I wrote a play in the 6<sup>th</sup> grade about Daniel Hale Williams and open heart surgery. About 17yrs ago I worked on a dance project with Carl Sagan and the SETI institute in Santa Cruz, CA. that began my interest in quantum physics and astronomy. However I can’t really say I understand astronomy, quantum physics, or the science behind surgery but the concepts, theories, and exploration do resonate with me as an artist. And so now this astrophysics just took my inquisitiveness even further. I was fascinated watching the modeling and simulation of gravitational wave sources involving compact objects, such as black-hole binaries, theoretical predictions of gravitational wave signals, evolution of star clusters and galaxy mergers. It sort of blew my mind. I’d never

seen anything like that. Watching the simulations on video with details of the spatial patterns and colors... It looked like dance. It looked like theatre to me. I'd like to show you briefly what I mean.

(show Hans Peter Bischof's video clips – RIT Golisano College of Computing & Informational Sciences - <http://spiegel.cs.rit.edu/~hpb/CCRG/>).

And so we embarked on this project to create through dance a learning experience intended to make accessible and expose the general public, with an emphasis on deaf and hard of hearing populations, pertinent scientific information and basic concepts from the fields of gravitational physics and astrophysics. Seems daunting doesn't it? Well, yes it was, and is. In a way it was difficult figuring out where to begin exactly. One of the guiding criteria was engaging a consultant in educational science who could identify what the science education outcomes and objectives could be. But how we arrived at those was all about imagination and creativity.

Creating connects us whether it's an artistic endeavor, an invention of some kind or a scientific experiment. When we create something it comes from us and we in a sense give it to the world and the world receives it and in that exchange we're connected. Yet beyond that interrelation (and I'm speaking more as an artist here I guess) there is something more. We ourselves are both the creator and the activity of creation – the *process* then becomes as vital as the outcome. We learn through the doing – that work of bringing imagination into manifestation; the theory into fact; the invisible visible, the impossible made possible. In a sort of esoteric way we creators (much like the cosmos itself) cultivate and engender a presence of light, illuminating, that is simultaneously around us and is us.

Our first dance pilot entitled: “Event Horizon” (basically referring to the surface surrounding black-holes) was a performance at the ‘Light in Winter – Science and Arts Festival’ in Ithaca, New York - an invitation that coincidentally grew out of a meeting here at CUNY at one of these conferences a few years ago. The production focused primarily on communicating our understanding of what happens in extreme astrophysical conditions of gravity, matter and magnetic field strength, especially black hole and neutron-star collisions through the use of advanced visualization techniques, dance and theatre. Basically the dance was a representation of the merger of black-holes and the gravitational pull of particles in the universe. It was received with an ovation and praise at the festival. But I think it didn't quite successfully disseminate or transfer scientific information. After some reevaluating our team had to come up with a way to break down some of these larger theories into more attainable information that a general audience would be able to grasp.

I wondered if we were really teaching science through dance, or more accurately bringing dance and science together? Each has their own authenticity, discipline, focus and value. In the interdisciplinary journey I began to think the dance and the astrophysics were components, integrating their two cultures birthing a new idea; rather than trying to use the language on one to interpret the language of the other. This new genre would contain both the science information and the dance information and both would be

communicative vehicles. I thought, what if we just start with the idea of gravity and create more of a multi-media dance event? So our next evolution in this process will be a concert February 11- 13 in our theatre at NTID called 'Danser et Voler (To Dance and To Fly). The collaborators have multiplied. We're working with science students who are building a 3D projected image of space (and at a particular point in the performance the audience will be given 3D glasses to fully experience the 3D environment). An illusionist consultant is creating magic illusions to give the effect of defying gravity. We're connecting dance with the robotics program at RIT; incorporating circus arts such as the lyra dance and aerial dancing; there's a chorus and an original musical composition of mine called "Inside the Light." all part of our attempt to engage and stimulate interest in the audience about science and dance.

In our new production there are 3 areas or sections that guide the audience and build on each other: the first loosely based on Galileo's establishing a scientific methodology, and exploration of force moving through space. I call this section 'The Motion of Awakened Discovery'. The second part takes inspiration from Isaac Newton's mechanical theories that attempted to explain almost every phenomenon observed in the universe. – gravity, the force between two objects, and his mathematical theories of natural philosophy. This section I call 'From Ground to Air' Followed by the final section I call 'Abstraction of Perception: Light and Dream'. The impetus for this section comes partly from Einstein's work – his theories on the motion of molecules and light and his ideas on the interconnectedness of the structure of the universe as a whole. So how exactly are we presenting this? Well we're working on that now and it is enormously exciting! But I do have a short personal story that I hope can demonstrate a bit more clearly the direction we're headed.

I had a profound experience 22 years ago that gave me a true understanding of this awakening or presence of light that occurs within the creative act. I was a dancer in a Chinese dance company in Macau (the only non-Chinese member of the company). We were touring in China and after our performances ended I traveled around the country on my own. I found myself in a small remote village. It appeared to be desolate. But eventually I came across a little girl. She was about 7 or 8 years old. She was sitting on the ground and drawing with a stick in the dirt. When she saw me she stood up shaking and scared to death. I smiled at her. She kept shaking and I kept smiling. After some time I knelt down on the ground and slowly moved close to her. I picked up a stick and began to draw in the dirt as she had. Now if we step back and take a look at the process I mentioned earlier related to the production – Galileo represents the discovery, the awakening and so I chose to become aware of this little girl's creative activity. I hadn't expected anything really but let myself be open to what was happening in the moment and how I could relate to it. Perhaps the Newtonian explanation would be that if we know the position of every molecule and atom, we could foresee everything and by extension know everything. Then the question might become would we know that we know everything? Anyway....It might have just been subconsciously that I knew there was some connection to be made in the drawing on the ground because I didn't allow myself to ponder about it I just did it.

My thinking became broader, further moving into my imagination. Looking back now and analyzing it I think I followed my imagination; its “knowledge” had a path, like a guiding light that I could follow to resolve the situation. Now to finish the story - After awhile, I noticed the little girl was watching over my shoulder as I drew pictures with the stick. She then sat down and picked up her stick and we drew together. This exchange and unguarded sharing taught me the true meaning of oneness; an openness to something between us. I began to feel at peace. At one. Whole. What seemed to be barriers preventing the girl and me from connecting just moments before – I was male she was female, Chinese / African-American, adult / child, different languages, etc. - all subsided as superficial elements. There was this shared mutuality between this little girl and I. If we think of Einstein as the expansion of understanding and experience; expanding into a realm where possible and impossible seem merely two sides of one entity then the universe, an ever encircling presence, and everything in it is interconnected and somehow has a gravitational pull toward each other. He wrote “A person experiences life as something separated from the rest - a kind of optical delusion of consciousness. Our task must be to free ourselves from this self-imposed prison, and through compassion, to find the reality of Oneness.”

Ken Laws (who is here in the audience) wrote eloquently in his book *Physics, Dance and the Pas de Deux*, “Dance uses kinesthetic and visual experience to discover and communicate aspects of the human condition. Dance movement helps develop nonlinguistic representations of concepts. Pantomime and gesture inherent in dance engage kinesthetic learning and personal expression. Its presence is fleeting and so each moment is a distinct and exceptional experience requiring the dancer and the observer to think expansively often beyond the boundaries of convention.” The motion inherent in dance (motion being the very elemental movement behavior we’re all connected to) is governed by the laws of physics and the medium seems especially appropriate for communicating concepts and ideas from the field of astrophysics to an audience.

Science and dance enable us to communicate, to learn and gain a deeper and more useful understanding of how things around us work and our relationship to them. Both dance and science make use of characteristics of spatial intelligence – transforming or modifying that which is seen, and imagining that which has never been seen. Choreographer Murray Louis in his insightful book *Inside Dance* says, “In the pursuit of knowledge and discovery of hidden truths, these disciplines can complement each other to deepen the meaning and broaden our understanding of nature in terms of both the internal (personal) universe and the external (cosmic) universe.”

Maybe because I teach deaf students to dance I’ve developed a sensitivity to what it means to be inclusive and the detriment exclusivity produces. I want to mention this in a broader sense the idea of accessibility and cultivating interest in science to underserved and underrepresented populations – people of color, people with disabilities, and the elderly. It isn’t only that diverse populations can benefit from science education but that science can learn from their unique perspectives, their unique experiences. We have to be attentive, thoughtful and willing to take responsibility and the risks for reaching out and

building alliances across all kinds of boundaries. This is yet another area where dance and the performing arts can be of assistance.

Now if you will indulge me for a moment.. Raise your arms and then just let them fall into your lap. We can think of that as science; beginning to address ideas of gravity. Now let's try again – raise your arms and this time let them come down slowly – a duet with gravity. I'll add a little melody..... So our experience is not exclusively this or that (science or art) but maybe our experience is more the interpretation of our experience. Yes we want to know how life works but we also want to experience what life is?

Thank You.