Beyond words: science and visual theatre

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Science is becoming increasingly visible in the theatre, where it is often regarded as a fertile source of ideas and metaphors. I argue that we should not overlook the potential of science as an abundant well of visual imagery for the theatre. Scientific research and discovery can provide new physical languages for theatrical expression, and new ways of looking at and depicting the world. Scientists at the nexus of experiment and discovery have often seen things never before observed by human eyes; such visions, recreated or re-imagined for a theatre audience, can stimulate the kind of wonderment that is central to the theatrical experience.

Scientists are (at least according to convention) people who crave ideas. The archetypal scientist sits and theorizes. This is at best a caricature, but scientists rarely challenge it, and when scientists become interested and involved in the theatre—or playwrights become entranced by science—it is a theatre of ideas that typically results. Drama becomes a tool for exploring notions pirated from the scientific tradition, and that exploration is laden with a burden of words. Michael Frayn's captivating *Copenhagen*, the current blueprint for 'science in theatre', is a rich cascade of words. There is next to no 'action' in the play, aside from the compelling action unfolding in the characters' mental worlds as they struggle through dialogue to make sense of what has happened to them.

Consider, then, this thought from Peter Brook: "Is there another language, just as exacting for the author as a language of words? Is there a language of actions, a language of sounds – a language of word-as-part-of-movement, of word-as-lie, word-as-parody, of word-as-rubbish, of word-as-contradiction, of word-shock or word-cry?" Brook is regarded as one of the fathers of physical theatre, and yet his points of reference in his book *The Empty Space* (Penguin, 1990), from which this quote comes, are Shakespeare, Brecht, Beckett: dramatists whose skill at crafting words defines much of their genius. What Brook wants to tell us is not that theatre should abandon words, less still ideas—but that real theatre, the theatre that grips us and holds us breathless until the lights come up, is not about either of these things. Rather, it is about ritual, on the one hand, and entertainment, on the other. Both of these things—the 'holy' and the 'rough' theatre, as Brooks expresses it—have their own languages, within which words are, in both cases, strictly optional.

I want to make the plea that science-in-theatre (I like Carl Djerassi's term, though I'd debate its meaning) remember this notion of theatre. Brook's opening sentences should be the starting point for everything theatrical: "I can take any empty space and call it a bare stage. A man walks across this empty space whilst someone else is watching him, and this is all that is needed for an act of theatre to be engaged." This walking and watching is the fundamental act of drama. A script is not a piece of theatre. A script might indeed start from an idea, but theatre starts with an action.

There are two reasons why this consideration finds particular resonance in productions that engage in some way with science. First, it reflects what goes on in science itself. Science is not theory. Think of the atom, invented by Leucippus in the fifth century BC, confidently imagined by Newton, drawn by Dalton—and yet some eminent scientists were still loath to accept the notion until we could watch atoms *act*, inducing the dance of pigment grains in Jean Perrin's microscope in 1908. Experiment is where an idea is played out, put to the test, and only then does it become real. One might even argue that only then does it become science. Similarly, there is no Lear on the printed page, but only when he steps onto the stage. Before that, there are just words (but what words!) that Lear is instructed to speak.

Second, it is one of the most exciting, yet curiously under-exploited, characteristics of science—as far as the dramatist is concerned—that it presents a vast palette of images that are potentially useful to the theatre. Science has been mined for its metaphors, not just by playwrights but by authors and poets. But how many have begun to take advantage of science's panoply of images? New technologies give us stunning displays of light and sound, video capabilities, interactive interfaces between performer, audience and environment, robotics and holography; but that is not exactly what I'm talking about. Science has an inherent theatricality. Go to the Boston Science Museum and watch the 'lightning display', where great "oak-cleaving thunder-bolts" blast through the tense and gloomy space. Think of Eve Curie's description of how her parents returned late one night to their lab and found it all aglow from beakers of radium solution, "like faint fairy lights" in Marie's words. Newton's *experimentum crucis* in his darkened room, Röntgen's discovery of X-rays via the shadowed bones of his hand: these are moments of theatre, which happened also to be central to the development of scientific thought.

But of what use are they to the dramatist who is *not* portraying Curie, Newton or Röntgen? I am suggesting simply that, if we want to bring science into theatre, we ensure not to neglect its visual aspect in favour of its intellectual content. Most of all, we would do well to remember how, in experiments like these, there is the essential element of theatre: a moment of sheer wonderment.

What are you saying?

We should never attempt to assay science-in-theatre at all before being clear what we are trying to achieve. There is, I think, a more or less clean divide, so far, between theatre writers looking to science, and scientists looking to theatre. For Tom Stoppard, science provides the metaphorical content, the intellectual meat, of a good story. The same is true

in several recent productions in London's West End, such as Charlotte Jones's *A Humble Boy* and David Auburn's *Proof*. Sometimes this works elegantly, but it is a hard trick to pull off. The problem is that the metaphors are generally unfamiliar to a lay audience, so characters have to engage in thinly disguised tutorials to make sure the audience gets the point. It is difficult to make such explanations sound convincing—partly because real scientists are rarely so adept at encapsulating their ideas neatly in a nutshell as the characters are obliged to be (the playwright can hardly risk making a poor fist of the explaining), and partly because it is hard even for the most well-informed non-scientist to make these characters sound genuine. Most 'stage scientists' are as convincing as those in Hollywood films—like actors trying to persuade us that they are expert footballers, or art historians. We are all too clearly seeing not a scientist but a portrayal of one.

Copenhagen wins out here not just because Michael Frayn did his homework but because his characters are not make-believe scientists explaining Great Ideas to the uninformed, but real scientists who can afford to take mutual knowledge for granted when they converse. Frayn isn't trying to teach us anything, but wants instead to explore his characters' inner lives.

Theatre that arises from within science is typically aiming for the converse. When that is explicitly the case—when the aim is pedagogical—we would be wrong to expect great theatre at the same time, although it can still be entertaining or thought-provoking. "Theatre is a very old, traditional and respected method of teaching and communicating ideas", suggest Sondra Quinn and Jacalyn Bedworth of the Science Museum of Minnesota, and that is true enough. But even the most didactic of Brechtian theatre is not trying to give us *information* as such, and it would be fatal if it were. Plays that attempt to explore moral and ethical issues of, say, genetic or biomedical technologies (a favourite theme of the Wellcome Trust's Science on Stage and Screen programme) can certainly claim a long historical heritage; but that intention, even if coupled to sharp and stylish dialogue, does not provide a prescription for theatre. We must in the end come back to Brook's vision: one person watching another. What is told, what is suggested, cannot be put into words. Shakespeare explores an awesome range of moral dilemmas, but it is hard even to say precisely what these are, let alone to agree on the conclusions he reaches.

Sometimes science finds its way into theatre neither as metaphor nor as pedagogy. This, I think, is when I like it best. It does not advertise itself, it does not say 'here is the science'; it merely appears as a part of life. It is hard for science to merge so seamlessly in any area of our culture, so we should be glad when it happens on stage. The science is there simply because it is part of the story. Ken Campbell's gloriously meandering (though, I think, deceptively well crafted) monologues take us into quantum physics not because he wants us to understand it or because it parallels any deeper message but because he enjoys telling us about it. Brecht's Galileo just happens to be a scientist; his science produces the dilemmas of his life, but it doesn't illustrate or reflect them. In a sense, *The Life of Galileo* has nothing to do with science, which is why the science blends in so well.

Science as spectacle

In Britain (and to some extent in the USA), Stoppard and Frayn have become the canonical reference points for science in theatre. But there is another strand of contemporary theatre that is keen to engage much more directly with the visual aspects of science. Its practitioners call it physical theatre, visual theatre, experimental theatre, or even 'total theatre'. Its inspiration comes from people like Brook, the French revivalist of mime Jacques Lecoq, and the grand thaumaturgists of physical performance Antoine Artaud and Jerzy Grotowski.

This movement brings to bear a rich and strange concoction of techniques and traditions: clown and circus skills, traditional mime, dance, puppetry, Commedia dell'Arte. At its worst it dissolves into the tedious and introspective incoherence of some 'experimental theatre' of the 1960s and 70s; at its best, it produces some of the most sublime and exciting theatre you can find anywhere. The masters of the art are surely Theatre de Complicité, a collaborative company that devises its own texts and makes movement and physicality an integral part of its storytelling.

David Harradine is a member of another company, Fevered Sleep, that includes a strong element of the visual and the physical in its work. Fevered Sleep recently collaborated with Nottingham-based photographer and chemist Dallas Simpson to develop a production called *Written with Light*, which, in Harradine's words, looked at the "history and poetry of photographs". The company explored, with Simpson's assistance, the ways in which photographic images could be chemically manipulated. Harradine says that working with a scientist not only helped with technicalities but also revealed to him "the incredibly rich creative potential that can be found in the bringing of a scientific knowledge or perspective to the artistic process."

Brian Lipson's visually rich *A Large Attendance in the Antechamber* took us into the strange and disturbing world of Francis Galton, Darwin's cousin and the originator of eugenics. There was little historical about this production; we were not supposed to regard it as an accurate portrayal of Galton the man. Instead, there were projections, maps, strange and ingenious devices: a feast for the eyes. We emerge little the wiser about who Galton was and what he thought, but without any doubt that we have seen something theatrical and engaging.

Another one-man show that combined scientific material with physical theatre was Paul Jepson's *The Idiot*, a re-telling of Dostoevsky's tale of the naïve and epileptic Prince Myshkin. Jepson and the performer Claus Damgaard consulted with people who suffer from epilepsy so that the portrayals of seizures might be not just physically but also psychologically as realistic as possible. The play grew from a short production commissioned for a scientific conference on epilepsy, and Jepson says that the doctors at the conference were keen to ask Damgaard after the performance how his 'seizures' felt—since this is something real epilepsy patients cannot describe.

But is mimicking an epileptic fit at all akin to experiencing one? The remarkable thing about physical performance, as many actors will testify, is how much the physical conditions the emotional. In the Method acting tradition pioneered by the Russian actor and director Stanislavsky, which has exerted a compelling influence on several generations of stage and screen actors, performers aim to establish their psychological, internal reality before then searching for the gestures and physical language that it seems to demand. But physical performers commonly work the other way around: they find that a particular physicality automatically creates a particular emotional world. The movement comes first, and the actor must be alive to what it tells him or her about the character. One of the most accomplished of physical performers, the Japanese actor Yoshi Oida, describes how this happened when he was preparing for Peter Brooks' production of Oliver Sacks' book *The Man Who Mistook His Wife For a Hat*, another play about neurological malfunction:

> We began the process by improvising certain scenes from the book. Up until this point, I had always thought that the subject matter for theatre had to be something that was directly connected with the experience of the audience. It might be about love, or family, or death, or politics, but it had to be something that the audience recognised from their own lives. But neurology? If it was psychology perhaps I could identify with it, since I might have experienced the same kind of emotional turmoil. But neurological damage is a very specific phenomenon, and is not often encountered in most people's lives. So for me there was a problem with the material Peter had chosen to work on. I couldn't identify with it, and frankly, I wondered why on earth we were doing it.
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> Then people started improvising. I watched them, and suddenly I felt 'I am that person!' It was completely illogical, but I felt the same as that damaged individual. I was terrified.
>
> (Yoshi Oida, *The Invisible Actor*; Methuen, 1997)

This production too involved a lot of research into the neurological conditions being portrayed, by watching documentaries, reading case studies, talking with Sacks himself, and visiting a neurological hospital in Paris. These experiences left a deep impression on Oida:

> What I saw in those patients was how strong the basic human energy is… It doesn't matter whether the person is immobile, or near to death, something keeps fighting to maintain life.

I would contend that, while this is something that can certainly be comprehended intellectually, it cannot be convincingly *performed* without having experienced the physicality of such a situation.

The British theatre and film company Forkbeard Fantasy make inventive and visually arresting use of technology, scientific imagery and scientific themes in their works. Their production *The Brain* (Figure 1) was featured in the Creating Sparks Festival of Science and Art hosted in London by the British Association for the Advancement of Science in 2000, and was the progeny of a collaboration with neurophysiologist Emil Toescu from

the University of Birmingham. And science was never far from the surface in Forkbeard Fantasy's riotous re-telling of *Frankenstein* in 2001.

Theatre groups like this are perhaps uniquely well equipped to make the most of collaborative ventures with scientists, because they have a sensibility that urges them to show rather than to tell: not to get bogged down in trying to communicate scientific ideas in words, but simply to ask 'how can I make theatre from this?'

My own theatre company, Homunculus, is modest by comparison, if not indeed better described as a 'virtual company'. But I have also been interested in exploring the visual possibilities of science, in particular those offered by that most tactile and practical of sciences: chemistry.

That chemistry lends itself to theatre has been recognized at least since Humphry Davy took the stage at the Royal Institution. John J. Griffin's *Chemical Recreations*, first published in 1834, was a veritable compendium for the aspiring chemical magician: Oliver Sacks recalls in *Uncle Tungsten* (Picador, 2001) how he eagerly experimented with the 'Volatile Plum Pudding' ("it leaves its dish and rises to the ceiling"), the 'Fountain of Fire', the 'Brilliant Deflagration'. Leonard Ford kept the tradition of chemical magic alive in the 1950s with his shows at the annual science fair at Mankato State College in Minnesota, which provided the testing ground for the tricks described in his *Chemical Magic* (Dover, 1959).

Those were easier days for the amateur chemist. Sacks could go to the store of the firm set up by Griffin in north London and buy just about any reagent he fancied. Ford allowed that "you may eliminate dangerous experiments from a chemical magic show", but clearly he preferred to take the risk: "explosions and fires produce the most spectacular demonstrations". Today such tricks are hampered by a chemophobia that induces panic the moment an unfamiliar substance is sighted. If it has a Hazchem sign on it, you're assumed to be about to eradicate the audience. "It's hard enough to convince a venue to let you get water on the floor, sometimes, without splashing sulphuric acid and dissolved lead around", says Harradine. I'll vouch for that: a performance of my play *Paracelsus the Great* at University College London was nearly barred at the last moment when it was discovered that I intended to set off a magnesium flash (even though the audience was almost entirely from the chemistry department). My strategy is now to forget to mention such things in advance.

At one level, chemical magic may be nothing more than another stage effect, like fake blood or dry ice. But it has convinced me of the hypnotic attraction and breathtaking impact that even a simple scientific experiment can have on an audience who has never before seen it performed live before their eyes. After all, the 'ghosts' created on the nineteenth-century stage by the arch illusionist Henry Pepper, using nothing more than reflections in a sheet of glass, reputedly caused a sensation in Victorian London—despite the familiarity of the underlying phenomenon. When the principles are unknown in daily life, science truly becomes magic. In one play I conducted the synthesis of nylon—a simple enough procedure, but the effect of drawing out the polymerized thread from a

beaker of liquid—a strand that seems to appear from nowhere and to have no end—was mesmerizing. Even my scientist colleagues suspected that some sleight of hand must have been involved. (Would that I were so dextrous.) When white wine turned instantly red as it was poured into an empty glass during *Paracelsus*, I could almost guarantee a gasp from the audience, though the chemistry was utterly straightforward (and thus, for once, wonderfully reliable).

A play that has nothing to say, or no story to tell, can never be sustained by visual imagery, however striking. But images can convey some things that words cannot. I would never contemplate preparing a play about the Curies that did not include that scene of ghostly luminescence, which reveals so powerfully the magic and mystery of discovery. With its electron microscopes and radio telescopes, science shows us elements of reality that we'd otherwise never suspect. In themselves, these visions represent nothing but information. In a dramatic context, one has the opportunity to use them to stimulate the mind, to make allusions, connections, suggestions. And let's not forget that in the theatre, anything can happen: people can become particles, a door can open onto a galaxy, we can hear the sounds of molecules. It would be a shame, then, if the curtain were to draw back to reveal nothing but words.

Figure caption

Figure 1 *The Brain* by Fantasy Forkbeard, a performance developed in collaboration with a neurophysiologist, was rich in striking visual images. (Photo: Penny Saunders/Fantasy Forkbeard.)

Biographical note

Philip Ball is a science writer and a consultant editor for *Nature*, where he was formerly an editor for physical sciences for over ten years. He writes on all areas of science for the popular and academic press, and is the author of seven books, including *H_2O: A Biography of Water* (1999) and *Bright Earth: The Invention of Colour* (2001). He has trained in various styles of theatre, and runs an 'occasional' theatre company, Homunculus, on a shoestring budget.