

An open letter of concern to Engineering UK, British Science Association, Royal Academy of Engineering, the Science Council, Young Engineers, STEMNET and the Association for Science Education.

# Brainiac Live – science<sup>communication</sup> abuse

Imagine you're organising the largest STEM engagement event in the UK. You need a headline theatre production, to showcase the best of your multi-million pound extravaganza. Perhaps you compile a wish list of what you're looking for:

- faked demonstrations
- mistakes in basic science
- disregard for copycat risks
- counter-productive desperation to 'make science fun'
- a profound lack of passion for science.

No? No, that probably wouldn't be your ideal criteria. Yet the organisers of The Big Bang Fair have booked a headline act for the last 4 years which commits all of these science communication 'crimes'. Recently this show made its West End debut and I was appalled to discover that both STEMNET and the ASE are promoting tickets to the show.

I strongly believe that these STEM engagement organisations can and should do better. I'm passionate about science demonstrations and their power to inspire in the emotive setting of a theatre. That is why I am so disappointed and frustrated by *Brainiac Live – Science Abuse* ([www.brainiaclive.com](http://www.brainiaclive.com)). I have no objection to theatre shows which offer one purely visceral spectacle after another, as long as that is their stated objective and the audience understands what they are getting. My ire is reserved for theatre companies and event organisers who either implicitly or explicitly sell this product as educational, cruelly exploiting parents and teachers.

## Crime 1: Faking it

It is with a strong sense of disbelief that I find myself *having* to point out that faking your results is the very antithesis of science demonstration shows and, in fact, science. In such shows there is an implicit contract between the performer and the audience that you will reveal authentic scientific phenomena in a transparent and honest way. If you fake one demo for extra impact, why stop there? Why not throw in lots of special stage effects as demonstrations and hope the gullible audience don't spot them?

Well this is what *Brainiac Live* does, time after time. The damaging subtext is that science isn't interesting enough in itself, so it has to be enhanced by trickery. The greatest harm occurs when you secretly mix genuine phenomena with fakes so that the audience doesn't know what is real and what is simulated. The saddest part is that I, and others, have tried to explain this integrity problem to the show's theatrical producers for several years, and I'm beginning to realise that they simply don't understand the nature of their crime. To me, that speaks volumes about their attitude towards science.

The rocket-powered spinning chair routine is symptomatic of most of what is wrong with *Brainiac Live* and its choice as a headline act for the Big Bang Fair. You can see an old clip of this demo here [www.youtube.com/watch?v=jvgEq4mmc3o](http://www.youtube.com/watch?v=jvgEq4mmc3o) or in one of the many unofficial videos on YouTube. A fire extinguisher is attached to an office chair. As the extinguisher is periodically fired, the audience counts the number of times the performer rotates in 15 seconds. Stage pyros are then added to the set-up and the demo is repeated, with the chair spinning much faster. This effect is attributed to the pyrotechnics, which they call 'rockets' in recent shows, rather than the fact that he is firing the extinguisher almost continuously on the second occasion! This could have been a high-impact demo with strong theatrical production values and good audience interaction. However, it is completely compromised by a shameful disregard for the science and a preference to trick the audience with a stage firework. It's so frustrating - a single line at the end of the routine, humorously acknowledging the real role of the 'rockets', could have saved it entirely. But they don't seem to care.

Other faked demos include:

- touching a 12V electric fence with a metal coat hanger creates a ridiculously over-the-top shower of 'sparks' and 'smoke';
- the same electric fence which, although meant to shock the performers, is not actually plugged into the battery (according to the producer the actors complained that it hurt too much so it's never switched on and they just act if they are getting shocked. In one case, a performer even gets 'accidentally shocked' through three layers of clothing in order to justify a faux corpsing routine where they fall over in staged laughter);
- a performer wrapped in plastic runs on a carpet tile to build up a static charge – she is then discharged with a wire to her nose to seemingly set-off an explosion;
- unconvincing stage explosion effects to supposedly 'blow up' a telephone, a caravan and a microwave.

In an act of delicious retribution by the demo gods, in a couple of the shows I have seen live or on YouTube several of these special effects have failed at the crucial moments; confusing the audience further.

## Crime 2: Getting the science wrong

STEM engagement organisations have a duty to ensure that events they book or promote take their science communication responsibilities seriously. However, almost all of the explanations offered in *Brainiac Live* are superficial, tokenistic and brief. They are delivered either dutifully with a begrudging 'let's get through this quickly' tone or a disjointed 'now for the science bit' feel. This is a classic case of poor science communication from people who clearly believe that science is toxic and needs to be kept as far from the audience as possible, so that they can get on with the next easy bang or laugh. It doesn't have to be this way. It's enough to make professional science communicators weep.

By offering so few meaningful explanations *Brainiac Live* has greatly reduced its scope for scientific errors, but despite this there are still some howlers in the show. For example, it takes considerable ingenuity to make a scientific mistake before the show starts, but in the show publicity *Brainiac Live* have promised for years to find out "How much oxygen & helium do you have to ignite to make a really loud bang?" Helium? Really? Ok, let's see you try.

In the show, it turns out that they meant hydrogen. For years, thousands of children at the Big Bang Fair have been 'learning' that when you light a balloon filled with 2/3s hydrogen and 1/3 air (confusingly labelled 'N' for nitrogen) that "the nitrogen makes the hydrogen angry". Helium.

Nitrogen. Anthropomorphisms aside, what have they got against innocent inert gases? When I tried to start a campaign to exonerate nitrogen at a science communication conference a few years ago, the producer insisted that their science consultant had approved this line and it was staying in the script. This year I was interested to hear that “the air” is now getting the blame. So I’m optimistic that in a couple of years we may finally have the real culprit, oxygen, in the dock. The wheels of Brainiac justice, apparently, turn slowly.

At one point during a liquid nitrogen routine, the lead performer refers to the frozen flowers as ‘smoking’. This highlights one of the problems with using actors who are not trained in science to perform science demonstrations.

### Crime 3: Ignoring copycat risks

Given the scale of the Big Bang Fair audiences, I’m concerned that the organisers of the event do not enforce a risk assessment policy which includes imitation risks. As well as minimising risks during the performance, science communicators have an obligation to *try* to reduce the likelihood of children attempting to copy demonstrations after the show in a way which is dangerous. The risk of imitation increases with the appeal of the demo, the availability of the equipment, and the *apparent* ease of replication.

There are at least three demos in the current version of the show which pose significant copycat risks - playing with electrical shocks from an electric fence; being full-body wrapped in plastic; and playing with fire extinguishers which, according to the performer, “some people waste putting out fires”. The potential consequences of these copycat risks – electrocution, suffocation and tampering with fire safety equipment – are all life-threatening. I consider it highly irresponsible to perform these stunts to a mixed age audience without any explicit warnings in the scripts for each routine. Flashing up a quick safety warning on the screen with a funny voice-over at the start of the show is simply not sufficient – operationally, or, in my view, legally or morally.

### Crime 4: Sweetening the ‘bitter pill’ of science

The headline act of the Big Bang Fair has an extremely confused relationship with education. On the one hand, the producer has given lectures about the role entertainment shows can play in education; the show appears at STEM engagement events; at one point a performer promises “we’re going to learn all about electricity”; and the show makes, rather apologetic, attempts at explanations for most of the classic science demonstrations it uses. Yet, on the other hand, you can sense that their hearts are not really in it, and that they’d be much happier orchestrating a louder shout from the audience or anarchically blowing stuff up. One reviewer has referred to this unease as “Brainiac’s palpable terror at being seen as improving” (Andrzej Lukowski, Time Out).

They don’t seem to have realised that this approach is completely counter-productive. Audiences may enjoy the momentary appeal of flashes and bangs, but they aren’t stupid. They know when performers are trying to ‘make science fun’ by desperately adding external enhancements to sweeten the pill. Some of the audience might reasonably conclude that perhaps science isn’t interesting after all, if four performers have to work so hard to try to ‘make it’ interesting. So, an approach which is patronising even for a general family audience becomes offensive in the context of a STEM engagement event where most of the audience already have an appetite for science and engineering.

## Crime 5: Not believing that science is interesting

The biggest irony of *Brainiac Live* being booked or promoted by STEM engagement organisations is that it is self-evidently written and performed by people who refuse to believe that science is interesting. This is a capital crime in science communication.

It is a considerable achievement to perform science demonstrations for an hour barely expressing *any* passion towards science. The emotions of any performer are extremely contagious for the audience. Yet, these performers only got excited when fire, bangs, or pain was involved. No-one got visibly enthusiastic about the phenomena behind these primitive reactions or why the demonstrations worked. This shamelessly plays to the audience's basest instincts and damages the impression that science is, in itself, interesting.

Given all of these problems, I'm genuinely concerned why some of the most prominent STEM engagement organisations in the UK should feel that *Brainiac Live* is a suitable show to headline the Big Bang Fair (led by Engineering UK in partnership with British Science Association, Royal Academy of Engineering, the Science Council, and Young Engineers), or to support through a ticket promotion of their West End shows (STEMNET and ASE).

Being able to perform science demonstrations in the controlled conditions of a theatre is an incredible privilege. It is an opportunity which should be accorded to the very best science communicators in our industry. Working with theatre producers who genuinely care about theatre and science, and combined with the raw emotional contagion generated by the theatre setting, these communicators could devise a science demonstration show which truly inspires audiences.

I despair at seeing the wonderful art and science behind science demonstrations being exploited by a theatre production company who do not seem to care about either. There are many passionate, knowledgeable, professional science demonstrators in the UK for whom this caricature of science communication is ludicrous. What impression of science do audiences leave with? What message does this send about the value and standard of science demonstration shows to the rest of the STEM engagement community? What reputational damage do you risk by booking or promoting such shows at educational events?

Paul McCrory

learn differently  
[www.learn-differently.com](http://www.learn-differently.com)