

Why science gets the reputation it deserves because of the way scientists think, act and re-act Part I

(and the case of 'Blue Monday' and the formula for addressing this question)

A personal essay by Andy Green FCIPR

Our society faces issues such as a profound threat from climate change, is on the verge of significantly extending its use of nuclear power, and needs to feed an ever-expanding population - while being compromised on being uncertain about the best way forward on issues such as genetically modified foods.

We live in a world of growing technological complexity. Never has the need for greater scientific understanding or literacy been so paramount.

Yet scientific illiteracy seems to be growing. Initiatives, such as the Committee on the Public Understanding of Science, were established in the UK to promote the cause of greater scientific knowledge, yet was later disbanded in 2002; symptomatic of an awareness of the challenge coupled with a failure to make a lasting difference. (It gets worse: for some time the task of public understanding of science has been working under the acronym 'PUS'.)

In his generous creation of a Chair for the Public Understanding of Science at Oxford University Dr. Charles Simonyi strikes an alarmist note in the Trust's manifesto: *"Considering the profoundly vital interdependence between the society at large and the scientific world, the dearth of effective information flow is positively dangerous."*

The causes for concern are confirmed in books such as Chris Mooney's *'Unscientific America'* highlighting how Americans are paying less attention to scientists; in every five hours of cable news, less than a minute is devoted to science and the number of newspapers with weekly science sections has shrunk by two-thirds over the past decade.

On a social network level, only 18 percent of Americans personally know a scientist, and few can name a living scientist. Mooney despairs that rejection of science is rampant with 46 percent of Americans denying evolution and thinking the Earth is less than 10,000 years old.

My own experience may not be untypical. Although university-educated, I left school without a single equivalent of a GCSE in science. Although I like nature programmes on television, *'New Scientist'* magazine and any books by Jared

Diamond are among my favourite reads, I never however, volunteer for the 'Science and Nature' category when playing 'Trivial Pursuits'.

In an age of greater complexity, there is a paradox: instead of people becoming more knowledgeable and sophisticated, about science and technology there appears to be a tendency to shy away from, even becoming simplistic in responding to and understanding the science of the world around them. There seems to be a bunker mentality in avoiding having to deal with the issue.

I put forward the theory in my book *'Effective Personal Communications'* [developed from an initial idea by Richard Florida in his *'The Rise of the Creative Class'*] that if a time traveller from 1900 going forward to 1950 would be overwhelmed by the technical transformation they would witness: the novelty of motor cars, aeroplanes, radio, television, would no doubt astound.

The same time traveller moving on another 50 years would notice some evidence of technological change, but would recognise a not-too dissimilar world to the one they left behind in 1950.

What would be significantly different would probably be sociological - the changes they encountered the role of women in society, greater diversity and tolerance on race, sexual orientation and disability would appear different to the world that had gone before.

Moving ahead, another 50 years, I argued the big difference the time traveller would notice is psychological - the growth in people's understanding of intrapersonal skills and knowledge: the people of 2050 would have greater self-awareness and be far more sensitive to dimensions such as body language, language in the words used in conversation and what they really mean.

I used the example of my daughter who, when just 12 years old told me: "*Dad, I hate it when you use reverse psychology on me!*" I reflected that I barely knew what reverse psychology was, and then thought, 'what would her children be saying to her?'

So, I now recognise I was partly wrong assessing the future. I would now add that the time traveller would notice how much smarter people have got in knowing about themselves, the world within their own minds.

But in the same realm, the time traveller would notice how little the typical denizen of 2050 would know about the world around them; how things work, the extraordinary science underpinning the ordinary of their times.

So, back to today's world of 2011.

A world of scientifically ignorant people is not desirable. I work on the premise that if people live in a world of ignorance they are vulnerable to manipulation, exploitation and persecution.

I call this dichotomy 'toxic ignorance' – where not knowing what you should know, can be bad for you, your health and your future.

So, what can we do now?

There have been a good number of able and committed people, who have spent considerable time and energy addressing this issue, yet sadly, as a society we are falling short; witnessed by the growth in scientific illiteracy.

Is the problem that these people are starting from the wrong place, and how this problem is abetted, or even inherently caused by the way scientists think, act and communicate?

How are the key stakeholders within the scientific community guilty of perpetuating misunderstanding? Are they themselves a barrier to wider public insight and connection with science? Has the growth of a new social tribe - for want of a better label, 'fundamentalist scientists' - also holding back the cause of science?

I offer my insights in addressing the challenge of scientific illiteracy. I have nearly 30 year professional experience spent in public relations and communications helping people, organizations and causes explain themselves, and build better relations with their wider worlds.

I am also the author of a number of well-received books about brand communications and creativity.

I would describe myself as an open-minded, humanist liberal. To that end, I have a personal value in wanting people to be better consumers of the communications they receive or contribute to. By being a more capable consumer it could then help avoid their individually, and collectively, being misled or abused.

With a class of more empowered citizen communicators we can then work to make the world a better place, or at least be better equipped to fight any negative trends or issues. So that's my humanist/liberal value operating here, underpinning, and providing the motivation for this exercise to address an important issue our society faces.

Through my professional work I strive to get my clients the reputation they deserve. As an experienced public relations practitioner my rule of thumb of guiding any communication activity is to ask: *"Have you got the reputation you deserve?"*

I would imagine most people involved in science or promoting its cause would respond to this question in the negative. (I don't have any data on this – but wait to be contradicted.)

The question to start with then: *"Has science got the reputation it deserves? If not, why not?"*

So, how do we explain this?

Blue Monday, a personal experience

During the last six years I have been involved in what I can now recognise as a real-life experiment. It has led to world-wide media coverage, among many leading media titles, yet also incurring the wrath and vitriol of members of some well-connected science-based networks.

This experience has brought home to me the reality and highlighted some of the key challenges facing anyone promoting the cause of understanding scientific issues – to get science the reputation it deserves.

Let me explain. Let me tell you a story....

I happened to be in my office on Saturday, January 22nd 2005. Reading the news on the web it featured a story about the forthcoming Monday being defined as 'the most depressing day of the year'. The story was based on a study produced on behalf of Sky Travel which featured a formula identifying a number of significant factors – weather, debt, broken resolutions, time since the holiday period - which come together to make the Monday 'the most depressing day of the year'.

A university academic, Cliff Arnall, (a former lecturer and researcher at Cardiff University) produced the formula. (Note: There is no mention in this story of the day being called 'Blue Monday')

Cliff Arnall, as it turns out, is the anti-Christ, eats babies and raw meat, and burps afterwards. Sounds silly? Yet is perhaps no sillier than some of the spleen directed at Cliff, and latterly to me, for being part of what was to become the 'Blue Monday' story. (If this episode was a horse race, the reference one blogger made about planting a crossbow bolt in Cliff's forehead is still my choice for front-runner in the vitriol stakes.)

Blue Monday helped trigger my interest in the issue of science getting the reputation it deserves and prompting ideas to help address the questions about scientific illiteracy.

Looking back, I had stumbled across a potent word of mouth message (or 'meme' which I will later elaborate on) – the story initially instigated by Cliff Arnall of how a particular day is apparently the most depressing day.

I have a personal interest in mental health issues. My younger brother was born profoundly autistic. I know from previous professional experience that themed days, such as Red Nose Day, and a regional event I had been involved with called 'Yorkshire Day' on August 1st, can be highly effective fund-raising and promotional opportunities.

My estimation is that a themed day - which I subsequently called 'Blue Monday' - could raise at least £500,000 a year for mental health charities. (Just 1% of what the Comic Relief 'Red Nose' day raises in the UK.)

So, I had at hand a vehicle able to create extensive media interest and also raise money and awareness for mental health causes. Plus, it would be a comparatively easy task to make this happen. The idea of making this campaign happen also fitted in very well with my personal interests, motivations and professional skills.

Wrong. Despite encouraging discussions and activity with two national charities related to mental health on both occasions the organizations subsequently distanced themselves from my efforts and any connection with 'Blue Monday'.

The reason: a few influential scientists put a quiet word in behind the scenes. I was told they had suggested that the 'Blue Monday' story was 'bad science' and therefore the charities should have nothing to do with it.

I was initially angry – some good causes could raise £500,000 a year on a comparatively easy-to-do ticket – plus, for my sins, I also received a number of snide comments about me on various blogs.

I now reflect that I had stumbled into an arena of a bigger issue of what I call 'bilateral scientific illiteracy' – a failure by either side of the debate to fully understand the worldview of the other.

I have learnt from my personal experience, science does not have the reputation it deserves.

So, to get some value from experiences to make some contribution to making the world a better place, and so learn from my Blue Monday experience I would suggest there are seven key factors which shape the response to the question: *'Has science got the reputation it deserves?'*

The first part of this essay focuses on the seven key factors which include:

1. Batting on a bad wicket
2. Aristolean v Plato thinking - why 100% data is elusive
3. The truthiness about 'truth' – it's based on emotional perception
4. The messenger corrupts the message.
5. The message further corrupts the messengers' messages
6. The scientific establishment does not help
7. And sometimes your fans don't help - the rise of the 'Scientific Taliban'

The second part of the essay provides ideas and possible ways of ahead for addressing each of the seven factors, to enable scientists to get a better reputation for themselves and in turn, tackle the issue of bilateral scientific illiteracy in our society.

1. Batting on a bad wicket

There is a story about a tourist lost in Ireland who when asked for directions were told: *"I wouldn't start from here."*

We all use different languages to communicate between us and in order to understand the world around us. By languages I don't mean English, Welsh, or Cantonese.

Rather it is the different thinking languages, of verbal, spatial, tactile and mathematical.

In everyday life we predominantly use verbal reasoning – don't we?

Science however, makes significant use of mathematical language.

There's a joke that goes: Two thirds of people in the UK are no good at maths and the other 50% cannot add up either!

For most people it seems the mathematical language stops at plus, minus, multiply and divide.

There appears to be a widespread dyscalculia – a difficulty in learning or comprehending mathematics. At the extreme there will be those who suffer a numerical equivalent of dyslexia. Yet, for the majority it seems they have either failed to develop or nurture a more sophisticated understanding of how to process information in the medium of mathematics.

So, when it comes to statistics – and I won't put a figure on it - most people do not get beyond first base, ill-equipping them for any further scientific understanding and making them vulnerable to misleading stats and analysis based on dodgy maths.

And even when it comes to verbal reasoning scientific texts are littered with words unfriendly to the modern-day ear, words created not for their ease of use but rather for their logical structure. The end product of the names given to something scientific is determined to create a logical route to its parentage rather than in response to is the name easy to say.

Sure, deoxyribonucleic acid is better known as DNA, but the language of science among the wider populace is often resolutely incomprehensible.

So at the first base of discourse, science is inherently hard for the lazy mind. It is like the comment made by the character played by Minnie Driver in the film *'Good Will Hunting'* where she says to her genius boyfriend (played by Matt Damon) *"No one studies organic chemistry for fun."*

We live in a fast-moving world, where people need to understand things in an instant. If we cannot immediately comprehend we then latch on to the first thing that does. The vast majority do not plough their way through studying organic chemistry.

Instant gratification prevents a majority from taking the first step down a journey of scientific understanding and enlightenment; the need to engage with mathematics, compounded by its language being too hard, plus you also need to invest in and build a foundation of knowledge to gain understanding.

I made the point in my book *'The Upturn: your part in its rise'* that our education system is failing to inculcate the reality of coping with tedium (I flippantly suggested such a subject should be called 'Tedia Studies').

For many it seems, it is easier to click the remote, to flick past the complexities of science channel and go onto something more easily understandable. Deferred gratification in a fast-moving, uncertain world loses out to immediate gratification.

In much the same way Oscar Wilde dismissed socialism as: *"It will take too many evenings"*, so scientific understanding requires some initial graft, some paying of dues at the early stage, in order to gain a solid comprehension.

As a communications expert confronted with the task of popularising science, and wanting an easy task – I wouldn't choose to start from where science starts: it would take up too many evenings.

2. Aristolean v Plato thinking - why 100% data is elusive

Two icons of philosophy, Aristotle and Plato neatly characterise a polarity in how we think.

To summarise, Aristotle believed world was made up of separate objects. The right way to reason, to gain understanding was to break challenges, analysis, things up into their component parts. He reasoned that by understanding the parts we can then understand the whole.

In contrast Plato was convinced that humans are ultimately subjective; everyone has their own version of reality. The best way he reasoned to determine what is true is by playing one person's view against another. This is known as a dialectic process, essentially a competition of ideas. Through the debate and competition of ideas it would ultimately help you idea arrive at a 'truth'.

By moving up a hierarchy of ideas we could then establish the biggest idea of all, 'the good' or 'the truth' to inform all our reasoning and ensure the validity of the ideas it encompassed.

For Aristotle, it was the physical world that was ultimately real. Plato, in contrast, it was the world of ideas that formed his playing field.

Aristotle made no effort to persuade; he assumed that reasonable people would be convinced by the superior force of the logic created through analysis.

Plato used questions to encourage people to reach their own conclusions.

These philosophical approaches correlate to my concepts used in my teaching of creativity: every idea exists within a Box, and you have options of Small Box Thinking, working within the existing confines of analysis, or Bigger Box Thinking, where you operate within a wider context, or Different Box Thinking, where you start your thinking from a different position.

Aristotle was evidently a great Small Box thinker, whereas Plato using another person to stimulate the redefining of questions, and ultimately redefining the Box of Thinking, was a Big and Different Box thinker.

Science by definition is: *'a method of learning about the physical universe by applying the principles of the scientific method, which includes making*

empirical observations, proposing hypotheses to explain those observations, and testing those hypotheses in valid and reliable ways'.

It puts the data at its heart; the incontrovertible, verifiable facts.

It seems for many scientists, data rules.

My perception is that the crusade to tackle scientific illiteracy is restrained by the type of thinking scientists predominantly use. We have a situation of scientists explaining about science but they are being held back by using predominantly Aristotelean thinking and subsequent doing - rather than engaging primarily through the bigger picture world of Platonic dialectic, debate and wider referencing.

In a world where you focus on the detail, pursuing linear thought patterns to dig deeper, the world beyond these blinkers – any world containing not quite readily-discernable shapes or patterns, or certainly lacking extensive data - do not register as significant in your mental landscape.

Anything not fitting into your defined categories is likely to be rejected, or discounted as lacking scientific validity. There is a real danger you start thinking in discrete silos: within your silo you have a rich body of confirmatory evidence. But the silo is not the territory.

Richard Dawkins call this tendency to think in discrete categories *'the tyranny of the discontinuous mind'*. How much are scientists held back by discontinuous thinking? The over-focus and resulting narrowness of silo thinking can lead to a blinkeredness or even blindness to potential wider issues. And other viewpoints

Another challenge relating to boundaries of thinking is the very power of context – how things exist, operate within a wider environment and their reality is defined by how it relates to other things.

This is best explained by a personal anecdote; I went to a show featuring comedian Ken Dodd. His act includes picking on member of his audience, in this case, he picked on me: *"You sir, what is your surname?"* he enquired. *"Green"* I responded. His response could make anyone big headed: *"Do you know that means handsome, strong gentle and kind."* Before I could get too smug with the superior qualities inherent in my surname, he then asked: *"What is your first name?"* *"Andy"* I replied. He instantly retorted: *"That means not very."*

The challenge when facing any subject is not just to look within it, but also consider its wider context. The value of a subject is determined by its context not its immediate domain.

Visualise a glass with 50% of its volume containing water. Some scientists are guilty of just looking within the boundaries of the glass vessel rather than considering the bigger context: is the glass half empty or full? Is it a glass of water at all?

By focussing on the mechanics within a situation, scientific analytic thought runs the risk of failing to discern a wider meaning.

If you live in a world of data, a frustration you will encounter is that 100% data is always elusive. You cannot prove a hypothesis through observation, you can only disprove. One lesson of learning, including scientific discovery, is that the more you learn, the more you find out there is more to learn.

Even a musical note has footprints within. Just when you think you are on the verge of getting to the finite detail and understanding of anything, you discover there is more to discover. Listening to a radio discussion on the subject of randomness, I related to the point made by one scientist who argued that there is no such thing as 'randomness'. What we label 'random' is data within unmapped areas of knowledge.

We are surrounded by infinite complexity. In my creativity classes I use an exercise of innocuously asking, '*What is half of 13?*' I get some instant answers trotted out, but I persist: '*Is that the only answer?*' The realization of the exercise is that there are an infinite number of answers to the question. (Have a go yourself.)

The world we live in is made up of infinite complexity. In the UK we cannot accurately predict the weather; not because our scientists, in this case, the weather forecasters, are incompetent. But they face a reality of trying to ride a wild unpredictable beast of the complex dynamics that create the British weather. (In Britain we say we have four months of winter and bad weather the rest of the year.)

Our society does not respect complexity. We live in a world we expect control and command. Our new toys of databases and computer systems create the sensation that we are masters of our universe. (This is one of the factors which led to my observation that our world seemed to be getting more stupid despite growing technical sophistication. Stupidly, I thought I should do

something about this, devised a campaign called 'Stupid Aid' and wrote a book called *'Overcoming Stupidity'*.)

We should have respect for chaos: when I tune in to the radio and hear about road accidents on the traffic report, rather treat these as the exception, they should be contextualized by the reporter as: *'Amazingly, we have only had five accidents today....'* Given the complexity of the dynamic and numbers involved, we are expecting millions of drivers to successfully complete their journeys intact. I am always amazed how relatively few accidents there are (just think of the last time that idiot driving the car in front cut you up!)

As my on-going 'Stupid Aid' campaign seeks to highlight, our society has been guilty of over confidence in data; the lesson is that the map is not the territory.

Yet, if you spend your life constructing the map, focussing on the realization of greater detail within the map, your Aristotelean tradition will restrict your thinking to its boundaries.

Sometimes the coherent, fully explained data is not just there. Sometimes informal evidence can provide a guide. Take the example of how the Jupiter moon of Io was discovered. [Source: *'E=mc²'* by David Bodanis]

Io was supposed to travel around its planet every 42½ hours. Unfortunately for moon spotters and schedulers it never stuck to the schedule; sometimes it was slower, other times quicker. No one could predict a discernible pattern.

Astronomers at the time assumed the problem was how Io travelled, with ideas such as 'did it wobble during its orbit?'

The problem in transpired was not how Io was travelling, but rather how the Earth was travelling; in summer the Earth was closer to Jupiter and in the winter of same year Earth it was the other side of solar system – taking longer for Io's signal to reach earth.

The Danish astronomer Ole Roemer was exceptional in his analysis: rather than trying to get the oddity to fit the known facts, he used the oddity as a clue, a key to an as yet undefined solution. Yet Roemer, rather than being celebrated for offering new insight was ridiculed by his scientific peers, and was marginalised in his career. Only later, did his ideas gain acceptance.

Going back to my Blue Monday experience; sure there is no data to quantify the mood and state of people's thinking on the particular day of 'Blue

Monday'. (Defined by the psychologist Cliff Arnall as usually being the third Monday of January.)

We do however have some 'data', some evidence, albeit of an informal kind: since 2005 the story of Blue Monday has grown and grown in terms of scale of media coverage and its ability to replicate with ease, with just the tiniest of promptings from yours truly.

This, I would suggest, is offering some evidence, of an as yet, undefined mass phenomena, a zeitgeist – a mood of a time – perhaps indicating an under the surface root cause.

Cliff Arnall with his initial pinpointing of a date, and my later branding the date 'Blue Monday' were merely triggers for uncovering a latent phenomena.

Why is Christmas Day on December 25th? A common held theory is that the early Christians merely piggy-backed on an existing Pagan ritual of celebrating mid winter. Seemingly, our forefathers and foremothers perhaps wanted some cheering up in the middle of a bleak season in the northern hemisphere.

Linking the event of a Pagan celebration with another underlying issue created a bigger occasion. (Does this seem a familiar strategy to you?) The underpinning rationale was presumably to cheer people up in response to an undefined, no data-collected zeitgeist of people feeling fed up, a feeling of discontentment in mid winter.

'Blue Monday' I would suggest, could merely be a further, perhaps a minor wave of discontentment, a month after the mid-winter celebrations (now labelled 'Christmas').

Perhaps abetted by modern phenomena, such as the monthly pay check, the monthly on-coming of the credit card bill, and a social more of creating New Year's resolutions, it all helps create a further wave of discontentment.

Sure, there is no data to support this theory, but then again, I don't see any statistical data about the mid winter blues timing with the Christmas period. I would suggest the potency of the Blue Monday meme launched since 2005 is an intellectual touchstone for justifying Blue Monday, as it offers a clue to a possible Zeitgeist.

From my Blue Monday experience, some members of the scientific community do have problems engaging in a dialogue where they insist 100% data has to

be evident before the conversation can begin. 100% data is only available for the closed mind in well prescribed and defined situations.

In my creativity classes I do an exercise where I have three sums:

$$2+2 = 4$$

$$3+2 = 6$$

$$3+4 = 7$$

I then ask if anyone notices anything about the three sums, and people readily point out that the middle one is incorrect. I further ask if they notice anything else.

After much speculation I highlight how two out of the three sums are right. In the real world, sure you do not want a surgeon operating on you who only has a two out of three success record. Yet, in the context of the question '*Can you go ahead with two out of three sums adding up?*' In many instances it is OK to run with, entertain situations where two out of three sums provide sufficient justification to entertain an idea or concept.

Excellence is different from perfection and anyone in business will tell you that you will be left behind if you wait for all the sums to add up.

The reality of our fast moving world, of news information reported at a rapid rate, sometimes creates situations where currently only two out of the three sums are either available or add up.

For the mind that would prefer 100%³ data this is uncomfortable.

Sometimes a little bit of insight can be more profound than all the available sums adding up: this can be more helpful to the path of understanding than having a 100%³ data.

For many scientists, by scrutinising and being immersed in the detail, the bigger picture can often be in danger of being overlooked. There is an inherent discomfort in tolerating ambiguity for all of us. For a mind reassured by available data, the pain of ambiguity can be even more uncomfortable.

For the cause of promoting greater understanding of science in the wider world, this is not a helpful characteristic. Indeed, it provides a prop, a support for not being able to connect fully with others - a scientific disconnect.

3. The truthiness about 'truth' – it's based on emotional perception!

In a political debate the American Senator Moynihan said: *'You can have your own opinions, but you can't have your own facts.'*

I want to disagree with him. Not because I want to mislead, lie, or create some form of legitimacy for untruths.

I would love there to be absolute truths. In the same way I would love there to be a Father Christmas. Yet I would question if we do live in a world where there are absolute rights, and counter-balancing absolute wrongs. (Wow! I had a real freaky moment writing this; the batteries in my computer mouse went suddenly dead with no indication of low juice!)

Now I am not an extreme post-modernist-relativist who would explain away everything as relative and make no moral stance. (My own view is that all things are relative: but some things are more relative than others, and individually you need to draw a line somewhere on issues, but equally appreciative your stance is relative.)

Sometimes you can get insight from someone outside the field of study, a non-expert in the domain.

A major philosophical concept, well at least a label, was not created by a philosopher – but by a comedian. During an episode of the political satire show *'The Colbert Report'* comedian Stephen Colbert coined the word 'truthiness'. It means in essence: *'the quality of stating concepts one wishes or believes to be true, rather than the facts.'*

Our reality is that we all see the world through 'truthiness glasses'. So, to counter Senator Moynihan, we do indeed have our own facts.

Thomas S. Kuhn in his *'The Structure of Scientific Revolutions'* (University of Chicago Press 1996) identified the root cause of what we call 'Groupthink' – where you are susceptible to peer pressure, social norms and other influences – with the concept of 'paradigm'.

He writes: *"Paradigms gain their status because they are more successful than their competitors in solving a few problems the group of practitioners has come to recognize as acute.The success of a paradigm...is at the start largely a promise of success discoverable in selected and still incomplete examples. Normal science consists in the actualization of that promise, an actualization achieved by extending the knowledge of those facts, that the paradigm displays*

as particularly revealing, by increasing the extent of the match between those facts and the paradigm's predictions, and by further articulation of the paradigm itself."

"Few people who are not actually practitioners of a mature science realize how much mop-up work of this sort of a paradigm leaves to be done or quite how fascinating such work can prove in its execution. And these points need to be understood. Mopping-up operations are what engage most scientists throughout their careers..."

"No part of the aim of normal science is to call forth new sorts of phenomena: indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others. Instead, normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies."

As the quantum physicist Max Planck reflected: *"A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it."*

I think the Danish astronomer Ole Roemer would agree with him.

I always take inspiration from the quote of legendary rock guitarist Frank Zappa when he said: *"Just because several million people think you're wrong doesn't mean they're right."*

In using the touchstone of 'truth' for their arguments, a belief in there being an absolute, fundamental existence of a truth, are members of the scientific community anchoring their messages to an untenable point?

Perceptions are just as valid as facts in our mental landscapes, certainly, when it comes to triggering belief, behaviours and Blue Monday bitchiness.

Let us first examine a scientific definition of 'Perception': *'Perception is the process by which organisms interpret and organize sensation to produce a meaningful experience of the world where sensory stimulation is translated into an organized mental experience.'* (Source: Peter Lindsay and Donald A Norman: *'Human Information Processing: An introduction to psychology'*)

You are the only one who can tap into your perceptions – and how do you know you are really perceiving what you are perceiving? A conundrum mitigating against 100% external validation.

An encounter I had with a scientist, an academic, charged with popularizing science at their university illustrates the power of truthiness in shaping our thinking and how we respond to new information.

When sharing the Blue Monday story he interrupted and said: *"Doesn't Cliff Arnall gets a royalty every time his formula for the most depressing day gets used?"*

Now, this ostensibly was an intelligent person who must have some knowledge of the publishing world, and would know that his statement would not stand up to the most cursory of examinations: How could such a royalty be exacted?

Indeed, Cliff has gone on public record stating that he earned just £1,500 from the assignment of devising the formula.

Yet, when I contradicted the academic, you could tell by their reaction and response that they just refused to believe my statement. They erected a barrier in their mental landscape preventing the recognition of 'the truth' of this new information.

They did not want the dissonance, the anxiety to upset their existing world view, which acts as a magnet for any negative information about Cliff Arnall, and precludes contradictory data, otherwise their truthiness, their definition of truth would need to be re-evaluated.

So, it does not matter if Blue Monday exists or not, in terms of being validated by data. You can have your own facts. We all cultivate positive illusions about ourselves to boost or protect our self esteem, make ourselves happier, and to cope with difficult challenges.

Our brain's reticular activating system filters how we see the world, filtering incoming data according to what you want to see. We prime ourselves to notice certain things; implicitly we do not see other things.

Imagine there is such a thing as an absolute truth umbrella; where everyone sheltering under it is protected by an implicit belief that by being where they are helps them get on to the path of absolute understanding and enlightenment. It protects them from a world where outside it rains ignorance, misunderstanding, and falsehoods, leading to at its extreme beliefs in voodoo, and at the very least not understanding about scientific deductive process.

To representatives of the scientific community sheltering under this umbrella, it makes them feel protected, comfortable and in a better place than those outside.

The reality however, is that there is no umbrella. There is no rain of ignorance. Just a big cloud of perceptions.

I saw a brilliant musical *'Enron'*, based on telling the story of the financial fraud and catastrophe caused by the rise and collapse of the eponymous corporation.

In one scene a financial expert, Sheryl Sloman tries to explain how everyone, including groups of very intelligent financial analysts and journalists were taken in by the financial scam: *"There's a strange thing goes on inside a bubble. It's hard to describe. People who are in it can't see outside of it, don't believe there is an outside. You get glazed over. I believed in ENRON. Everybody did. I told people again and again to keep buying that stock and I kept rating it and supporting it and championing it like it was my own child. And people say, how could you? If you didn't understand how it worked. Well. You get on a plane, you don't understand exactly how it works, but you believe it'll fly. You know — and everyone else boarding that plane knows — it'll fly up into the air and take you to your destination, crazy as that may seem. And if you got out your seat, said 'I'm not flying, I don't know how it works,' you'd look crazy. Well, it's like that. Except. Imagine if the belief that the plane could fly was all that was keeping it in the air. It'd be fine. If everybody believed. If nobody got scared. As long as people didn't ask stupid questions. About what it is keeps planes in the air."*

I am not suggesting the scientific community is engaged in a conspiracy, con or wilfully trying to create its own bubble of confidence. But there is a danger of a community of people living in a bubble of who 'get it', have a knowledge of science, statistics and scientific method, and label themselves as 'scientists', existing in what they perceive within a wider world where the general public, the mass media 'don't get' this thing called science.

And the bubble perpetuates itself, so long as the folk keep thinking what they are thinking. That there is there is nice, open body of knowledge and methodology, and is accessible for anyone wanting to get it. Oblivious to the fact that, they the scientists by the way they think, act and re-act, might actually might be creating this bubble and barriers for others to enter.

The challenge we face in promoting greater understanding of science is the presence of relativism of knowledge; different groups' beliefs will filter how

and what they see – based on their needs to maintain the truthiness of their worldview.

Some will have an intense wanting for the plane to be in the air. For others, by not wanting to recognise the plane, will see a different picture without a plane in it.

On the one hand truthiness is what some people want to exist.

So, I want Blue Monday to exist to demonstrate that you can use your flexible thinking so you do not need to be depressed on the symbolically most depressing day – and you can use this occasion to promote personal well-being and help good causes.

On the other hand truthiness is what some people don't want to exist.

Blue Monday is another example of 'bad science' involving the 'corporate whore' Cliff Arnall.

And that's the truthiness of it. You can make your choice and take your pick.

4. The messenger corrupts the message.

Our understanding of the world around us, and how we see this world is shaped and framed by our unique personal paradigms – our ‘truthiness glasses’. These glasses frame our understanding the world we believe we see before us.

But this perception of reality is compounded by absorbing information which itself comes from a distorted source – the media, the information intermediaries in the world, such as newspapers, television, books, the web, social media tools - or even someone telling you a story.

The media animals digest information, agitate it, digest it and ruminate it, until we receive the burp of information they release to the world which we then choose to believe or discard according to our worldview.

The ‘information burp’ is shaped by the media animals’ workings and functioning, its inner needs and relationship needs with you.

So, the information burp which gets shared about science is processed by media animals; media which gets accused of simplifying, sanitising, stretching or simply ignoring what scientists perceive as the valid and truthful information science has to offer.

Some scientists may see this as an anti science bias, even a vendetta against their discipline of knowledge.

Leading campaigner for a better recognition of science Ben Goldacre in the introduction to his book *‘Bad Science’* writes: *‘We will examine how the media promote the public misunderstanding of science, their single-minded passion for pointless non-stories and their basic misunderstanding of statistics and evidence.’*

One senses many years of frustration from a scientist committed to popularizing greater understanding of his cause who writes a weekly column in the *‘Guardian’* newspaper.

Goldacre has a theory of why the media is seemingly so anti-science. I shall quote at length to highlight the depth of his feeling (and not to be accused of taking any words out of context):

‘My basic hypothesis is this: the people who run the media are humanities graduates with little understanding of science, who wear their ignorance as a

badge of honour. Secretly, deep down, perhaps they resent the fact that they have denied themselves access to the most significant developments in the history of Western thought from the past 200 years; but there is an attack implicit in all media coverage of science: in their choice of stories, and the way they cover them, the media create a parody of science. On this template, science is portrayed as groundless, incomprehensible, didactic truth statements from scientists who themselves are socially powerful, arbitrary, unelected authority figures. They are detached from reality; they do work that is either wacky or dangerous, but either way, everything in science is tenuous, contradictory, probably going to change soon and most ridiculously 'hard to understand'. Having created this parody, the commentariat then attack it, as if they were genuinely critiquing what science is all about.

But speaking as someone who has spent a lifetime working with the media I would stress it is not personal or specific against science – it's just the way the media works.

I am certainly no fan of what I call 'Nonebrity culture' – stories about people who are famous for no particular reason. (In previous ages, celebrity was a by-product of achievement in a domain, now it is a distilled essence, sought for its own right.)

And we now live in an age of 'churnalism' where material, produced by public relations people like me, is used without critical checking. (I would argue that information from public relations sources should be like a pair of spectacles – a possible aid to greater communication, but not the sole means of vision.)

On balance, I believe we get the journalists and media we deserve in our society.

I remember as a young public relations officer speaking at a trades union event on 'How to use the media' and being confronted with a barrage of resentment that the media were biased against organised labour.

Similarly, when speaking on the same topic to business audiences I was met with an equally scathing avalanche of how the media was against them too!

I was quite perplexed by this conundrum: they couldn't both be right!

The lesson I have since learnt, whether you are a trade unionist, a business person or even a scientist, is that you are all right – there is an anti-you bias.

Despite the existence in our world of the Rupert Murdochs and Silvio Berlusconi, the media is not operating as a sinister anti-you conspiracy.

The bias is the same syndrome of how any story-telling intermediary operates, from an age-old parable spreader to a modern-day blogger; the intermediary of the media in telling a story creates a prism to project your reality onto a wider world, in turn, often shaping a distorted perception of your reality.

If you start to understand how the media prism operates, the challenge is to recognise the media-anti-you prejudice as less of a personal grudge and more of relentless fudge, mish-mash of 'this-is-the-way-it-just-happens-to-be-with-the-media' and how information gets burped by the media.

News is as a matter of routine presented in terms of particular events or specific cases as 'episodic' news framing, in contrast to 'thematic' coverage which places issues and events in some general context.

Episodic framing portrays concrete events that throw a spotlight on an issue, while thematic framing presents a much broader brush collective of general evidence.

Science is grounded in thematic information. It has a foundation of knowledge which incrementally develops. As a result, it is severely handicapped in gaining the media spotlight with its diet of major new sensations.

Moreover, the incremental nature of how scientific knowledge grows - which militates against headlines - can also result in upset, and hence media-wary scientists, when a canny sub editor overstates their findings to create what is perceived as a catchy and high in news values title.

Science seemingly gets second class treatment compared to the human interest/celebrity/facts of superficial interest, which can be neatly packaged as an immediate story: *'Cheryl Cole has malaria' [a UK television celebrity]* is a more media-friendly story rather than an analysis of current trends for treating malaria through vector control strategies including using Artemisinin-based Combination Therapy, making insecticide-treated nets widely available, and indoor residual spraying.

You need identifiable personalities to help you shake your narrative stick at. Without the character, you don't have the quick, digestible, and episodic packaged news story.

The media 'burp' in order to attract others to its story simplifies complex issues to a level of anecdotal evidence and reasoning by resemblance, where if it fits a 'you-know-how-so-and-so-is-like-this-well-this-new-bit-of-news-is-like-this.' This media myopia inherently encourages people to settle upon causes and treatments that neatly fit already observed problems in their mental landscape.

The news media with its daily competition for newness, incessantly wanting the next story or splash headline inevitably focuses on the now, creating a short interest span – the opposite of science's need for a more detailed and on-going observation, and accumulation of a body of knowledge.

News reporting also has its strictures which can irritate the objective scientist.

The news story structure, such as the need for 'objectivity' of 'fairness', imposes a need to present two sides to a question. If this was a form of Platonic narrative – the greater truth will emerge to the reader/listener/viewer it would be helpful.

More often the media story uses an Aristotelean drive for breaking down the detail of a reality, and instead of juxtaposing two different elements of equal value and significance, you can often get a very marginal, insubstantial piece of data being given equal status as a major prevailing orthodoxy.

Scientists operate in a domain where there may be considerable consensus around a topic and any contrary views might be at the margins, or unsubstantial in their field. Yet, the media needs for 'objectivity' which uses the mechanic of providing a platform for contrasting views, can propel marginal or minority views to equal status as the prevailing orthodoxy.

The media, with its ability to prescribe the spread of information available to us can also dictate an agenda of what to think about. If science fails to get through these hurdles, you get the reality described by Chris Mooney in *'Unscientific America'* – we have an information diet short of its two portions of science.

Even the task of two people telling each other a story more often involves non-linear, logical routes - which will on occasions not always comply with 100% data being factual and accurate – because of the demands of creating a narrative and to make a point with the story.

The story teller has to engage the other person, trigger emotional connection, and also identify what is the 'universal truth' it is seeking to arrive at.

I am particularly inspired by the story of Australian scientist, Dr. Barry Marshall who was one of the discoverers of bacteria being a cause of gastritis and gastric ulcers.

Although later receiving a share in the 2005 Nobel Prize when making the discovery Marshall was met with scepticism by the scientific community.

To demonstrate that the *H. pylori* bacteria caused gastritis and was not merely a bystander, Marshall drank a beaker of the stuff. He became ill with nausea and vomiting, but succeeded in graphically demonstrating his case; he had created a story to make his message gain credence. [In PR terms I call this 'eating the dog food'!]

Marshall and his colleague Warren should be an inspiration to all scientists; that you do not just need the data. You also need a good story. [Their work should also be welcomed by curry lovers everywhere, myself included. To tell another story: in their original paper, Warren and Marshall showed that most stomach ulcers and gastritis were caused by infection by this bacterium and not by spicy food as had been assumed before!]

Reading about the life of film producer David Puttnam, one of his former colleague's, film scriptwriter Bruce Robinson recalls the factual inaccuracies in the Oscar-winning film *'The Killing Fields'* and its depiction of the horrors of the Khmer Rouge regime in Cambodia. He justifies the fabrication of some parts of the story in order to translate a complex narrative through the medium of a film which had the task of attracting people to it, keeping them engaged and sharing a body of information: *"As a film maker David was right in essence, that 'The greater truth' can come from a few lies."* (*Source, *'David Puttnam, the story so far'* by Andrew Yule.)

For anyone who has been a parent (assuming certain values are in place) you aspire to teach your children to tell the truth. There are times however, when, in what you judge to be the interest of the child you tell a lie – a white lie.

The communicator may face the need to invent or create phrases or messages that can cram a lot of intellectual distance into a short verbal leap. Being flexible with part of 'the truth' can enable a far greater, more profound truth to be recognised.

From my Blue Monday experience, some members of the scientific community do have problems engaging in a dialogue where they insist 100% validated data has to be evident before the conversation can begin.

Sure being a dogmatic deductionist can help in your quest to gain new knowledge and break the barriers of ignorance. Othertimes, however, a little bit of insight can be more profound than having all the sums adding up.

This need to tolerate some ambiguity may be uncomfortable for these people, but perhaps the sincere path to a greater truth may contain some artificial paving stones.

Any story has to be framed, and may even partly made up in some cases to enable the story teller to arrive at what they see as a 'truth'.

Blue Monday is an example of a story-friendly package: it caters for 'you know that feeling you get in January, you're a bit fed up with being skint, fed up with the weather, and you've not really delivered in making your New Year resolutions happen, well it's now been discovered that there is a special day...'

In the bigger context of how we make sense of the world around us, the information we receive via the media animals, the 'media burp' as I call it, provides inherent barriers or sieves for anyone wanting to flog rational, logical, long-term analysis and fact.

You will probably still remember the earlier reference to the celebrity Cheryl Cole having malaria, but may well have forgotten the key elements of vector control strategies for treating malaria.

5. The message further corrupts the messengers' messages

In the communications world the message that makes the most impact are not the ones supported by the most extensive data or research. Instead, it is the 'sticky' message, the message that you can easily remember and pass on.

I am about to ruin your day now. You most likely will not like these songs:
'*Itsibitsyteenyweeny yellow polka dot bikini*', *Agadoo*, or
'*Supercalifragilisticexpialidocious*'

Sorry, I know from experience that echoes of these songs will now bug you for the rest of the day.

This demonstrates how 'sticky' information – even material you do not like or want to know can live on, and on. (Warning. If you come to my talk on '*Personal Brandcasting*' I get the audience to sing these songs in public.)

While on holiday in Anglesey, in north Wales we visited two sites: one site boasted over 3,000 years of history, providing a direct connection between ourselves and our forefathers. The other was a nondescript location, but it adopted a place name change.

One site was very busy with tourists, its car park packed with coaches and visitors, while at the other we were alone.

A seemingly astute move by local business people transformed its tourism fortunes. In the 1860's as a publicity stunt they re-christened their home town '*Llanfairpwllgwyngyllgogerychwyrndrobwlllantysiliogogoch*'. (Yes, I had to copy and cut and paste the name!)

Although the nearby Bryn Celli Dhu site is a rare example of Neolithic civilization its burial mound proves to be far less popular with visitors.

Is it because the site is inherently less worthy?

Or is this providing an example of what wins in the world of public attention and consciousness is not the best, the most worthy, the most innately profound?

Or is what wins the most memorable, dissonance free, indeed dissonance-friendly (in making you feel better about yourself and your world)?

Llanfairpwllgwyngyllgogerychwyrndrobwllllantysiliogogoch wins in the tourist stakes as it neatly captures what appears to the non-Welsh speaker as the idiosyncrasies of the Welsh language co-existing in parts of the United Kingdom with English.

The place name although often unpronounceable to the non-Welsh speaker is still iconic-friendly; the image of the word – such as the picturesque long train station name can come easily to mind, making what they say in the tourist trade as a 'Kodak photo opportunity'. (Most people will struggle actually trying to say or even remember the name itself – although I have a friend who claims he can say it backwards, by turning around and then reciting it to you!)

Its iconic quality, its sticky-ness, is the ease the concept can be remembered, stored away, and easily retrieved, in your mental filing cabinet, perhaps under a file heading of 'strange Welsh place name' or 'that long station name' rather than having a precise, accurate record of the word itself.

The existence of Llanfair pg (to use a local's abbreviation of the name) makes you feel good about yourself on your travels around Wales; you have a quick fix of linking-up with what is unfamiliar for many, the Welsh language.

The place is on a well-established route to Holyhead, so making it easy to include in travel schedules. Plus there is a large car park, plenty of tourist shops to make the encounter comfortable and easy to do as a tourist experience. It is good for your dissonance.

In contrast the Bryn Celli Dhu site, which I still do not know how to pronounce it even after being there, also involves a bit of a walk - albeit a very pleasant one - across country fields.

Any profound qualities it has lie in the mysteries, the secrets within, rather than an explicit quick fix and what it means to your current world. To gain fulfilment from the visit it requires an element of discernment, possibly some historical knowledge.

For many, encountering the ancient site of Bryn Celli Dhu would create anxiety – 'I-don't-really-understand-what's-there-and-so-choose-not-to-have-anything –to do-with-it' syndrome. It does not make many feel better about themselves. On the contrary, it could even them feel worse, perhaps engendering a sense of inadequacy created by the uncertainty of 'what is there to see in this grass mound?'

Bryn Celli Dhu is not good for your dissonance.

I am greatly indebted to the scientist Richard Dawkins for giving the world the concept of 'memes'. You could say he is 'the father of memes' (that statement is a meme).

In my talks I use the example given by Dawkins of how most of us know the words to the song '*Happy Birthday*' despite not attending a 'Happy Birthday Training Course' nor having read the 'Happy Birthday Training Manual'.

No, we know the words to '*Happy Birthday*' because the message is readily coherent, copyable and we have lived long enough to pass it on to others. This is a meme – a body of cultural information that gets passed on thanks to its inherent 'pass-on-ability'.

So we live in a world covered by an atmosphere and also where there is human 'infosphere' providing the space for human cultural inter-action.

The information within this infosphere is not necessarily the absolutely correct data. What will dominate in visibility and usage is the most meme-friendly, with its capability for self-replication.

If you operate in a cause and effect scientific world memes are like a weed or a wild beast on your prairie, or the computer virus spamming its way around the network. Memes may not be an inconvenient truth, but they certainly are, for the purist, for someone just wanting rational, objective truth, an inconvenient body of noise and distortion in our mental landscape.

"A lie can travel halfway around the world while the truth is putting on its shoes" is a quote attributed to Mark Twain (It would be deliciously ironic if he never actually said this.) But there certainly is validity in the insight of the statement. It recognizes that what is identified as 'The Truth' is usually more complex and complicated than neat black-and-white, Yes/No easily packaged and more effective memes of untruths.

One of my favourite cartoons features three students wearing T shirts. The two younger wears bear slogans like '*Save the Whale*' and '*Ban the Bomb*'. The elder looking one has a message: '*It's a bit more complicated than that*'. In the caption the two younger students grumble to each other: "*Don't you hate mature students!*"

And yes, like the mature student, the reality of any situation is more complicated than what can be defined on a T shirt. Yet, it is the easily

memorable, meme-friendly T shirt slogan which gets communicated, while the right, correct, absolutely scientifically-verified data is still getting its shoes on.

All of us need to become better and more sophisticated consumers and users of media and communications. Because we get the communications we deserve.

The message for the scientific community is that the message which gets relayed is not the logical truth – it is the one most communication-friendly. At its core a message has to be meme-friendly. If we are going to promote the cause of greater understanding of science we need to have an armoury of meme-friendly science memes.

For my part, I will continue to promote the Blue Monday meme – that you do not need to be depressed on the day symbolically labelled as ‘the most depressing day of the year’, indeed it can be engineered to be a fun and enjoyable day linked to creating some social good.

I perceive Blue Monday to have the potential to create a social good – pass it on.

6. The scientific establishment does not help

One of the challenges of getting science the reputation it deserves is that scientists, and it seems the scientific establishment, want to gain acceptance exclusively on their terms.

Evidence of this is demonstrated by the mission of Simonyi Professorship Chair for the Public Understanding of Science [of which Richard Dawkins was the first chair]. The post was founded in 1995, by a donation from Dr. Charles Simonyi.

The aim of the Professorship, as described on its website:

'is to communicate science to the public without, in doing so, losing those elements of scholarship which constitute the essence of true understanding.

it is useful to distinguish between the roles of scholars and popularisers. The university chair is intended for accomplished scholars who have made original contributions to their field, and who are able to grasp the subject, when necessary, at the highest levels of abstraction. A populariser, on the other hand, focuses mainly on the size of the audience and frequently gets separated from the world of scholarship. Popularisers often write on immediate concerns or even fads. In some cases they seduce less educated audiences by offering a patronizingly oversimplified or exaggerated view of the state of the art or the scientific process itself. While the role of populariser may still be valuable, nevertheless it is not one supported by this chair.'

So, the scientific establishment want public acceptability, but do not want to get its hands dirty in case it *'patronizingly oversimplified or exaggerated [a] view of the art of the scientific process itself'*.

Is it just me who finds that statement itself, suffocatingly patronizing?

The world of science wants its recognition but wants to start the process from where it is standing. It wants understanding to be acquired by radiating out from its world-view.

Sorry, but communications does not work like this.

Communications is not what you want to say about yourself: it is what others want to hear from you.

Let me share one of my favourite communications stories to illustrate this crucial, fundamental point.

It apparently was a glorious spring day in New York in the 1960's, when one of America's greatest copywriters, Rosser Reeves went out with a colleague from their Madison Avenue office for a picnic in Central Park.

Rosser was the guy who is credited with creating the concept of the 'usp' – the unique selling proposition, where rather than sell 101 different advantages you offer, you identify and focus upon the significant point of difference in your product. The HBO TV series *'Mad Men'* wonderfully captures the feel of this era, a world inhabited by people like Reeves.

Going back to our story, on their way back to the office Rosser and his colleague came across a blind man begging in the street. The beggar's sales communications consisted of a passive stance and holding a hand-written sign.

The sign said:

'I am blind'.

Rosser and his colleague observed how everyone just strode past the blind man, ignoring his plea for help and perhaps share their generosity.

Rosser, so the story goes, believed the blind man could dramatically improve his prospects with just a few extra words on the sign, and wagered his colleague he could transform the blind man's proposition.

The bet accepted, Rosser presumably persuaded the blind guy of the benefits of having one of America's greatest advertising men improve your sales pitch, wrote a few extra words on the sign. The advertising guys stood well back to study the impact of their amended communication.

Instead of ignoring the blind man people instead looked around them, and then gave a donation.

What were the few extra words added by Rosser to transform his situation? (Have a think.)

Rosser had added the words: *'It is springtime, [to the] I am blind'*

Previously the blind man had a one way communication, radiating out from his worldview pronouncing that he was blind.

To the people passing by, presumably not blind, could read the message, but what did it mean to their world? They were not blind. It might be unfortunate

that this other guy is, but 'rather him than me' may have been a prevailing attitude response.

Yet by adding the words '*It is springtime*' Rosser has effectively created a mental bridge between the two worlds, empathy between the two mindsets. They now have something in common.

I do a talk called '*Persuasion Judo*'. It seeks to equip communicators with a better toolbox for making their messages achieve real change.

And the very first step is that you start effective communications from the other person's world, not yours. You identify where they are at, what is preoccupying them, and what connection, link, commonality can you bridge between the different worlds.

Let's remind ourselves of the view of Chair for the Public Understanding of Science position: '*Popularisers often write on immediate concerns or even fads. In some cases they seduce less educated audiences by offering a patronizingly oversimplified or exaggerated view of the state of the art or the scientific process itself. ...*'

Is it patronizing to build a common ground with your target audience?

Gaining more than a foundation level of understanding science creates a negative counter-product: those who do succeed can develop hubris, a sense of arrogance of their distinct brand of knowledge and their belonging to the scientific fraternity.

"I'm a scientist!" is a bold affirmation I have repeatedly come across from individuals when introducing themselves (although they were not wearing a white lab coat at the time - or other iconic vestments of the science brand - so I took their word for it.)

This hubris, a sense of arrogance that as scientists they do indeed possess a superior bank of knowledge and understanding about our world, can lead to a curious and paradoxical naivety when it comes to communications.

For some scientists, may have the personal belief that it took a lot of hard work to gain specialist scientific knowledge and insight. Their high level of Intelligence Quotient is often not matched by a similar level of Emotional Quotient – the measure of interpersonal and empathy skills.

Their knowledge has immensely strong internal logic and validation, therefore it should be fair that this superiority be recognized and does not have to get grubby, its hands dirty in the world of communications.

The strong sense of logic can lead to a blindness, that words are not an end in themselves. Dawkins recognized this syndrome: *"Human suffering has been caused because too many of us cannot grasp that words are only tools for our use."* Communications is a tool, a means to an end; not the end itself.

Sitting alongside this hubris of superiority is often a small Comfort Zone containing the land of where these people with superior scientific knowledge are prepared to sit in when it comes to dealing with other people.

The people they are comfortable sitting alongside, and giving a leg up to scientific understanding, are often people in their mould – people like them, often middle class, well-educated and to them, safe. In fact this territory should be called a Complacency Zone.

As a result it leads to public relations activities which I call *'Blue Peter' campaigns'*, named after the long running BBC TV children's series, watched essentially by nice, middle class boys and girls, who will no doubt go onto university, and could well even study sciences.

As a young public relations officer working for the South Yorkshire Fire Service I coined the term *'Blue Peter campaigns'*. It came to me when I had to sit through the semi final of national fire safety quiz for young people featuring a successful team of youngsters from Doncaster.

They were a team of nice, middle class girls. Their success owed in part to the dedication of their local fire officer magnificently drilling and coaching them in advanced questions on fire safety – far removed from the realities of their world, and disciplining them to only press the buzzer when they were certain they had the right answer.

South Yorkshire Fire Service did face operational problems, such as false alarms and bonfires from young people in poorer housing areas - the sort of issues effective public relations could do something to tackle. But like so much of what constitutes 'community public relations' the Fire Service went down the easy path, the route in which they were most comfortable, investing scarce resources in groups that don't actually present a problem.

From what I have seen of efforts to engage science with the wider world, they do seem to echo the experience of the Blue Peter campaigns. What goes

under the label of 'public understanding of sciences' could be re-branded 'PLUS' – People Like Us Science.

Is the cause of 'public understanding of science' fundamentally held back by its very starting point. Skilled communicators in the world of popularising science operate at the end of the information food chain, with a body of knowledge already developed and refined. They inevitably get sucked into beginning their task with a question along the lines of: *'How do I translate this material to engage the wider world?'*

Instead, should their first question be along the lines of highlighting the seven factors listed in this essay for helping to cause a disconnect between science and the wider world?

Then having listed them then pose the question: *'Given these factors what is in it for the other person to be interested in what we have to say?'*

Should the whole issue of 'public understanding of science' be redefined as: 'science understanding of the public'?

Perhaps if the scientific community were begging in the street their sign would read: *'We are blind (a condition defined by lacking visual perception due to physiological or neurological factors) – and we will not condescend to acknowledge any similarities, commonalities, shared experiences with you - even if it is the season commonly referred to as springtime!'*

Or maybe it should read: *'We are visually impaired – to the realities of media and how communications works.'*

And a footnote to the sign would add: *"By failing to communicate from where people are at, rather than from our current position we will fail to fully engage, connect with or communicate the cause of greater understanding of science."*

7. And sometimes your fans don't help - the rise of The 'Scientific Taliban'

The comedian Marcus Brigstocke describes the change in his thinking in preparing for a show called 'God Collar' *(Time Out magazine February 4th 2010): "It was going to be dogmatically atheist,...but then a number of things happened in my life and I have found I don't want to be in that camp, thank you very much. I think what Richard Dawkins does is tremendous, but I really don't want to be one of the gang. Because, I'm not, I don't qualify."*

"I'm an atheist by default. I'm unhappily atheist. I wish there was a God....The first thing I say to the atheists in the audience is, 'You're not cleverer than everybody else so pipe the fuck down and stop being so smug.' Because of this assumption that if you're the atheist you're the only person who's thought about anything, and that's not just the case. I know some really thick atheists. Really thick."

"Part of the problem I have with atheists or secular movements versus religion is that everybody thinks the fight needs to be terminal and that the argument has to reach a conclusion. It's not going to. Neither side is going to be talked around, so you have to find a way of co-existing. You should be able to say: "I don't agree with you, but let's still have lunch."

In my work in teaching about how creativity works and facilitating idea creation sessions where I work with people to break down boundaries in their thinking and doing, my philosophy is driven by a belief that there is always something else, something new to find.

I am a great admirer of Richard Dawkins. I thoroughly enjoyed his work proselytizing atheism, *'The God Delusion'*. Yet at the end of the read I felt uncomfortable with the author's certainty and absolutism about his case.

It was not that I had a strong deist belief or faith.

Rather, it was my core philosophical belief that 'there always has to be another way', something beyond your boundaries of thinking.

I later read a copy of *'New Scientist'* magazine which juxtaposed the case for evolution v creationists. The article brought to my mind the quote given by the Beatles' drummer Ringo, when asked if he was a 'Mod' or a 'Rocker' (The wrong answer could have divided teenage opinion of the band at the time.)

Ringo's diplomatic reply was: *"I'm a Mocker"*. A response that saved his bacon, but also illustrate that you do not have to necessarily fit neatly into other people's categorizations.

Sometimes things refuse to fit neat labels of 'Yes' or 'No'.

I come across a lovely phrase in travel writer's Eric Weiner *'Geography of Bliss'* where he described the people of the kingdom of Bhutan where they live on the line between believing and unbelieving. It seemed a place where I too live – at least when it comes to religion. (As an 'active agnostic' I occasionally go to religious services, in order to celebrate being part of a wider community than to uphold a specific dogma; besides, shouldn't all agnostics go to church part-time anyway? Otherwise, they are not agnostic but apathetic.)

As I have mentioned, I am a great fan of Richard Dawkins the intellectual proselytiser: he kindly contributed to my book *'A minute with Tony Blair'* where he shared what he would say if he had a minute with the then Prime Minister, Tony Blair. By creating the concept and term 'memes' Dawkins has greatly influenced my work and thinking as a communicator.

Sadly, many other of his fans are less tolerant of others who may hold different views to the great man. The author of *'Unscientific America'* Chris Mooney was taken to task by reviewers on www.amazon.com for daring to criticize Richard Dawkins and others he labelled 'New Atheists'.

Mooney's main crime, it appears is to appeal to the example of the scientist Carl Sagan, who although when it came to religion was agnostic, evidently called for *'humility and mutual respect as a precondition to dialogue.'*

Unfortunately for the so-called New Atheists they have come to the fore in the Internet age, the age of the blogger.

Blogging has enabled anyone to create a platform for themselves and their views, and to connect and engage with the wider world. One reality is that instead of creating new connections and new ground in discourse there is a tendency for like-minded people to simply engage with similarly like-minded people.

Mooney describes blogging groups as: *"Grouping together of people who already agree about everything, then proceed to square and cube their agreements, becoming increasingly self assured and intolerant of other viewpoints."*

Manuel Castells in his work *'Communications Power'* also identifies this trend: *"A significant share of this form of mass self communication is closer to 'electronic autism' than to actual communication."*

I call this phenomena 'compound silo thinking' where a groupthink is established and anyone outside, or who may have a differing perspective or view is held out as 'the enemy'.

The faceless anonymity of social media encourages more extreme views and statements to be made, than would be done face to face. In my experience with Blue Monday, if some of the dialogue was between school kids it would be called Cyber bullying.

I too succumbed to the tendency.

In one Blue Monday blog response I created a term called 'snideshit' where I labelled some scientists as 'snide scientists' where SNIDE stood for:

S = Intelligent individuals

N = Too much time on their hands

I = Inadequate fact-checking

D = Failing to address real issues for the scientific community in the world

E = Easy target

The age of viral communications witnesses both an ease of transmitting a message between groups, but also easily picking up the behaviours and norms of the community within which you communicate, where initially you may have only had a tentative inclination towards.

Another facet experienced on the blogosphere among those writing on science – or at least responding to the Blue Monday story - is an undercurrent of anti-capitalism and anti-private sectorism. It manifests itself as being critical of anyone where they may be making money out of a situation, the fundamental essence of capitalism.

The word 'profit' is wheeled out as a damning indictment. 'Corporate whore' was one of the terms of endearment thrown at Cliff Arnall. The fact someone may be making money out of their activity is not seen in the context of: 'Hello, we don't all have fulltime or publicly-funded salaries or pensions: if you don't get paid by an academic institution or government, how else are you going to survive?'

Rather, any commercial imperative is seen as a negative, contaminating force.

In some cases, such as derogatory references to major figures, like Martin Seligman, the champion of what is called 'positive psychology' are often an Aunt Sally-like figures to hurl abuse at; in some cases it is a barely concealed envy.

If scientists are to effectively build bridges and engage others there is a need for what I call 'open hearted listening', where, to risk the wrath of certain reviewers on amazon.com - and to echo Sagan's message - we need to assert the need for humility and mutual respect as a precondition to dialogue.

BBC Radio 4 re-played a major historical debate from 1962 between two great experts, AJP Taylor and Hugh Trevor Roper in their different views on the causes of the Second World War.

Both men had strongly polarised views, very different perspectives on a major historical and emotional issue. Both men's reputations could be on the line in terms of the outcome of the debate. Yet, I was to discover that they were still both friends, mutually respecting colleagues, who went for long walks together.

Their example should be an inspiration of how you can debate without tripping into personal rancour.

The potential hubris of people educated to a high level – high on intelligence quotient, but possibly weaker on emotional quotient – facilitated by the anonymity of social media can accentuate the potential for rabid, nasty blogging

I am not being a mocker of scientists - some of my best friends are scientists. I am simply highlighting that many things in life are not black and white, yes/no, positions of: are you with me or against me.

I am not suggesting every scientist is a rabid, nasty blogger. Yet, if scientists are going to engage, communicate more widely, they need to take into account this facet of behaviour.

People can be sincere and respected in turn without having to agree with everything you say. (I do happen to agree with the statement that if two people agree on everything, one of them is useless!)

I just hope by promoting the message that scientists need to communicate their cause with respect and humility I don't get any threats of a cross bolt in my forehead, for saying what I'm saying!

Going forward

We need to redefine 'scientific illiteracy' not as a problem solely of non-scientists not knowing enough about science.

Rather it is a problem created from both sides of a scientific autism – where non-scientists may be guilty of not knowing about science, but equally those within the scientific community not fully appreciating how they are contributing to the problem of scientific illiteracy.

There is a language barrier between the mathematical based language of the scientific world and the emotional-based story-telling idiom of the non-scientific world.

We need to redefine the issue as 'bilateral scientific illiteracy' – a problem with two sides.

If we agree that something needs to be done - that science has a reputation problem because of its inherent difficulty, the failure for many who label themselves 'scientists' to understand how communications work, resulting in a subsequent failure to engage - what positive steps can to be taken?

One fundamental difficulty is the people driving the response to the challenge, those at the fore of doing something about the less than good reputation of science and scientific understanding are.... scientists.

With the scientific community driving this response is this a case of putting the lunatics in charge of the asylum? The people responsible for creating the problem are the same ones taking charge of any solution.

While the concepts of 'scientist' and 'communicator' are not mutually exclusive does the issue need to be taken out of the hands of the scientific community?

The problem is they are the ones living with the consequences of the problem – lack of government support and funding, misinformation in the wider community holding up scientific progress and recruitment of more scientists.

So, they are the ones with the motivation, they are the ones who feel the dissonance, the pain when they witness something wrong being promoted about science. They have the 'what's-in-it-for-me' self interest to spend the equivalent of their evenings doing something about it.

Any charge to assault the misunderstanding of science will inevitably be driven by the scientific community. The challenge is to help the nerds lead the herds.

Although new disciplines, such as the field of biosemiotics - which think about the world of biology not just as in its physical and chemical properties but also in the dimensions of signs and meanings and how participants interpret their part of the world – do provide new bridges between the data world of science and the specific human qualities of interpreting meaning within a situation.

Such developments however, are still currently at the margins of the science/outside world interface.

So, what more needs to be done to tackle bilateral scientific illiteracy?

Here is a seven point plan, correlating with our earlier seven key points for defining the cause of the problem.

For the scientific minded I have also created a formula:

$$\begin{array}{l} \textit{Science gets} \\ \textit{the reputation} \\ \textit{it deserves} \end{array} = f \frac{K^3 + (ftxF^2) + (ftxT^2) + M^2 + V^3 + H > x G}{IS + IM + NT + Hu \times E}$$

1. We need the equivalent of a 'fast food' of scientific knowledge.

Yes, one strand of attacking scientific illiteracy is expanding basic education in science at schools, to redouble any efforts for establishing a fundamental foundation of scientific knowledge and statistics; create a body of 'what every citizen should know' – an international school curriculum of the basics of science. (Obviously, this should be reviewed regularly, so as to accommodate new changes in understanding, thinking and knowledge.)

The basics of science include not just being knowledge, but also the basic philosophy and processes – to provide both the equivalent a Bible and a toolkit for everyday life.

The challenge is not just to identify what is to be taught, but actually teach it in a meaningful way. A study in 2011 by UK education standards body Ofsted issued a warning about 'dull science experiments in school, with thousands of children being let down in science school lessons by boring experiments.

Inspectors highlighted how practical work was too prescriptive, with a third of experiments 'merely following instructions'.

Someone with first hand experience of the shortcomings of science teaching in schools is my old friend Shaun Thorogood. He has been teaching science at a secondary level for over 30 years. His take on the situation is: *"The main problem is the curriculum, which is badly 'taught' due to pressure of the internal market in schools for every department to succeed. A level studies are not an exploration merely an exam factory with pupils only reading from colourful revision guides*

"Teachers tell the science pupils the answers and the way the experiments should work and put on a DVD of showing the discovery they should be making - so experiential learning is zero.

"Science in schools is taught like English Muslim children learn to memorize the Koran, where they can't even speak the language used in the text.

"The best scientists are young children with open minds and keen amateurs - both not subjected to the rack of scientific certainty that teachers spout out in order to meet their department targets."

The Ofsted study also noted that at primary level, since 2007, the performance of the brightest pupils aged seven to 11 has declined. It noted how children's grasp of science was often undermined by a lack of expertise among their teachers, which 'limited the challenge for some more able pupils'.

We should call this 'compound scientific illiteracy'; the lack of knowledge is helping to create further ignorance.

Looking beyond the shortcomings of science teaching in schools do we also need a brand like 'Live Aid', perhaps calling it 'Science Aid' to act as a top-down vehicle for promoting greater understanding? Do we need the equivalent of a charismatic Bob Geldof figure to lead the charge?

The reality in this instance is that no matter how eloquent or persuasive a communicator you have at the fore, Geldof was responding to a terrible disaster in Ethiopia with graphic images of children starving.

The disaster facing science is of a more insipid, glacial-like development, slowly engulfing us. We do not have the equivalent of the eyes of starving child looking into our soul.

The strategy therefore needs to be more bottom-up rather than top-down, building on many, many small immediate initiatives to engage rather than the one instant hit.

Where are the basic science and statistics courses on offer to help executives and citizens address their scientific lacuna?

Having recently moved to Wales from England I have been impressed by the efforts to ensure the survival of the Welsh language and its attendant culture.

To help people like me I can take advantage of a host learn Welsh courses, and I am signing up for a five week taster course. Where is the equivalent help from science? I do not want to do a GCSE in a science subject. I want a takeaway meal of a quick bite of new knowledge, and if I am further interested, then I will take the options for gourmet consumption of science and statistics.

Where are the equivalents of fast food to get a quick fix of science, or First Aid kits available to tend to the wounds of a lack of knowledge of science or statistics?

As a child I learnt so much about science (and also history) from the picture cards that were included in boxes of PG Tips tea bags. Whether it was about famous scientists, butterflies, or trees I learnt stuff I did not access anywhere else. Where are these cards, or their equivalent, in modern-day life?

We need more bite-sized chunks, whether it is executive courses or the humble picture card with your tea bags.

I will, for my part, raise with professional bodies I am involved with, such as the Chartered Institute of Public Relations, to investigate running taster courses on 'science and statistics for the humanities-graduates-with-little-understanding-of-science-who-wear-their-ignorance-as-a-badge-of-honour'.

In any campaign to communicate or change behaviour the best strategy is to build on the positives already there, to expand and make more prevalent.

There are many scientists championing the cause of greater understanding and building bridges, such as the author and campaigner Ben Goldacre.

Publications like '*New Scientist*' are expanding its coverage of the arts to reflect what it calls '*the increasing diffuse boundary separating science and the arts...and claims there has never been a more exciting time to be at the intersection of science and the arts.*' (NS August 21st 2010.) From the other side of the fence, publications such as the '*Financial Times*' magazine have stepped up their coverage of science for lay audiences.

There is much good work being done already and we need to build on the positives, particularly the initiatives that work back from where people are at.

Campaigns such as the excellent Citizen Scientists idea, a democratization of science feature amateurs – the ones with open minds - instead of salaried technocrats doing the investigation. (I loved the example of the Citizen Science competition winner who studied slugs in her back garden for her investigation.)

Instead of a top-down process of scientists talking down to people, we need more empowering, offering small steps to enable people to be engaged with the science around them. Winston Churchill referring to the challenges of a politician managing the science in the world around them, once said that scientists should be "*on tap not on top.*"

I would update this and say that in the cause of promoting greater understanding of science the facility to improve anyone's scientific literacy definitely needs to be more on tap.

2. Recognize you have a problem when you start 'Blue Card' thinking

The first stage in any rehabilitation programme is getting the patient to recognize they have a problem. If you are treating someone with alcoholism the initial step is to recognise they are an alcoholic.

In this proposed campaign what might appear to be a facetious suggestion can at least serve as a useful sign for anyone's thinking and doing. In sports, such as football, if the powers that be – i.e. the referee wants to impose a change in behaviour they issue a colour warning card, be it yellow or red. By metaphorically flashing the card it is initially a signal, a sign to the offending person that something has to stop and new behaviour begin.

What about using the metaphor of a warning card for anyone scientist to use when contemplating promoting the cause of science?

Why not have a 'Blue Card', as an allegorical symbol to issue in any conversation, debate or discourse to any scientist guilty of one of the seven factors outlined in this essay for a failure in communications? *"Guys were in danger of blue card thinking here..."* could be a response given in discussions with scientists making mistakes in seeking to engage with the wider world, which fails the cause of scientific literacy.

Recognition and signalling up that there is a problem is the first step – that a Blue card is being guilty of not appreciating the communications hurdles, that there is a scientific myopia, a scientific autism at work – the scientific disconnect.

Let us encourage the development of intrapersonal knowledge among scientists, recognising how their thinking frames can be defining what they see as a less than satisfactory outcome.

The best creativity technique I know of for helping you get in the shoes of others and help you see the world from their perspective is the use of role models.

By identifying a suitable role model, who is as close to your target market as possible, your thinking starts back from what you perceive to be their world, rather than your me-centric world.

The role models need to be someone you have a close knowledge of and the best ones are using real people you know, but celebrities and even fictional

characters can be used; (one of my most frequently used role models is the lieutenant character played by Tom Hanks in the film *'Saving Private Ryan'*)

Who are the role models we need to be using on both sides of the scientific autism divide to enable scientists to relate better with non-scientists and vice versa?

I might suggest the TV celebrity Cheryl Cole.

Any time a scientist is seeking to engage with the wider world, they should ask:

- *"What would Cheryl Cole make of this?"*
- *"How do I make my message so that Cheryl Cole would understand it?"*
- *"Am I bothered that the Cheryl Cole's of the world understand this?"*

3. Choose your battles – save the planet but let the silly stuff go.

In my book *'Creativity in Public Relations'* I updated the term 'impropaganda'. I proposed it should be defined as: *'a publicity act or media story that uses a flexibility with the facts and half-facts of a situation....it is sustained by a shared value between the communicator and the audience'* (or more simply it is an untruth where both sides are happy to go along with, i.e. it's a situation of I know I'm lying, you know I'm lying, but neither of us will openly acknowledge the lie.)

There is seemingly a lot of impropaganda out there in the media world; the reactions of the public, for example, to the latest machinations and mock drama inherent in television's popular light entertainment programme the *'X Factor'*.

People may complain after watching the show how it is a 'fix' where it is not necessarily the most talented who win in the early rounds, but the winners are those who can keep the story, the media interest, the public conversation, going for as long as possible.

Yet, people still watch it; playing along with the shared value that it is entertainment, something to talk or twitter about, but something in the end, ultimately harmless. It is OK to play along with the pretence

I again described this pseudo reality in *'Creativity in Public Relations'* about the world where: *'It is seemingly a game played in 'tabloid space', where no one gets hurt and both parties get what they want from the relationship. On one side of the equation, journalist licence is employed by the media to create good stories, and on the other side the equivalent creative licence for the publicist is used to supply the relevant fix for the journalist. It is a world where, rather like Father Christmas, fantasy is clinically bottled and marketed, but where make-believe has strayed into mainstream news.'*

So, when scientists see a media story where the real science is maybe less than 100% the tendency is to believe that journalists have been gullible to believe in a story which isn't scientifically true, and in turn the people who read or consume the media are in danger of digesting it, and being taken in by this false story; they must somehow then believe it.

When you get a news story about 'Blue Monday' and 'the most depressing day' do people really believe it is a 'scientific fact' or is it just light entertainment, to be taken with the same reverence as the latest episode of controversy about the 'judging' in television's *'X Factor'* ?

A frequent complaint from scientists is that if the media covers these type of light, 'science stories', then precludes media coverage of genuine scientific news.

Nonsense! These types of scientific non-stories are not keeping real science out; instead, are actually competing and fighting against other light entertainment stories. They rarely are funnelled through the decreasing number of specialist science correspondents, instead being the fodder of the general newsdesk.

The scientific community has got to learn to keep its powder dry for the important battles, fight for issues that are genuinely important.

My criteria for categorizing the different type of bad science stories would be:

Level 1 – bad science stories that can affect the future of humankind or our planet. They make a negative impact by distorting or misleading people on critical issues such as global warming, genetically modified food, or nuclear power.

Level 2 – bad science stories that can kill people. The case highlighted by Ben Goldacre for example on the MMR vaccine, where parents acting on inaccurate, bad science news stories made poor quality decisions on vaccinating their children that could lead avoidable deaths.

Level 3 – bad science stories that cost money, where people are getting ripped off by the modern-day equivalent of the snake oils salespeople pedalling dodgy goods, based on even dodgier bad science.

Level 4 - a bad science story factually inaccurate, yet no one is hurt by 'news' – the stuff of impropaganda.

By scientists and the scientific community responding and complaining about every bad science story they are in danger of being like the child who cried wolf once too often. The science community has limited resources both in terms of its own time and energies, plus also the limited time the outside world is likely to spare for any dialogue; use them where it matters.

When it comes to Level 4 bad science stories that are harmless impropaganda my advice would be to largely ignore them. Sure, publicists and PR people like me might then benefit from getting media coverage on impropaganda stories.

But that could be a small price to pay for genuinely addressing scientific bilateral illiteracy.

Scientists should avoid getting in a rage when they see what I call a Level 4 news story pedalling science, which can be patently see as failing to withstand basic scientific scrutiny.

But guess what? Most people reading these types of stories know they are not necessarily true either. They probably recognise it as a piece of harmless entertainment.

Is it condescending to assume the general people to be helplessly ignorant and naively believing everything printed before them? Maybe, this is an example of the 'middle class scientist' syndrome, where a touchstone of belief is that success is achieved by gaining more knowledge than other people. And this 'knowledge' thing is what is printed in black and white. The veracity of knowledge is substantiated by appearing in the printed word – the medium is the message.

Just because it is print, in black and white does not mean it has the same veracity as the peer-reviewed scientific paper. Or as Terry Wogan, the BBC broadcaster flippantly remarks: *"It's in the 'Sun' newspaper; so it must be true!"*

In promoting the cause of 'good science' there is need to adopt a broader approach from Caesar's wife strategy of being beyond reproach, and instead seek a wider dialogue with 'the enemy' – whether it be the media or popular culture.

There is a danger of always being sanctimonious, which in turn, hinders co-operation, and bridge building from engaging with where people are at, rather than where intelligent opinion thinks they should be.

In our quest to address scientific illiteracy it is better to focus on real critical issues where bad science can cost lives or in lesser cases money.

The scientific community need to recognise the existence of 'truthiness' and 'impropaganda' – and choose to take a stand and fight where it can make a real difference.

And that's the truthiness of it.

4. Avoid the Blue Peter stuff, fight the *Numptis*, and just maybe, have a laugh

There is a need for the non-scientific community, such as professional communicators, to do more to explain how the media works and how the communications process operates, to ensure all citizens are better equipped in dealing with the world around them.

Any campaign to tackle scientific illiteracy needs to build on the existing positives: why doesn't the writer Ben Goldacre have his own television slot? (On British television for example, he could be included as a feature on *'Newsnight'* or *'Channel 4 News'*.)

We need more 'celebrity' scientists. One short cut could be to use a group of people who have scientific training, are regularly seen by audiences, and are greatly trusted and revered (well, certainly in the UK).

I refer to weather forecasters who appear on our screens or radios (the ones actually trained as meteorologists.) They already have profile and a rapport where they are liked and trusted. This can be used to provide a platform for their being scientific ambassadors

The scientific community could in turn benefit from a fundamental shift in their approach to building bridges of understanding with the outside world.

Rather than a strategy of offering carrots, such as running media awards schemes for journalists who would have anyway written positive things about science, why not go to the other extreme and penalise journalists for any examples of acts of scientific ignorance?

Ben Goldacre paints a vivid picture of the humanities graduates who populate and dominate the media world. Even if it is a reality, the way these people operate has not come down from a top-down edict or instruction from some almighty force (I am not sure if Rupert Murdoch is anti-science, and even he has limits to his power.)

Rather, the media reality Goldacre describes is one created through emergence, fashioned by its environment than created by design. The good news then is that by changing part of the environment you can influence the growth and outcome of things operating within that environment.

At present any *'humanities-graduates-journalist-with-little-understanding-of-science-who-wear-their-ignorance-as-a-badge-of-honour'* gets away with acts

of scientific desecration. If they face a tirade from scientists they may not care as they are not part of their tribe, and like a seagull the journalist can swoop down, leave their mess, and fly away.

I am a great believer that you can judge a person by what you imagine they would have been like in the school playground. I get the feeling that many junior scientists when faced with a conflict or a challenging debate in the playground, would resort to instinct – go away and do more revision, or right eloquent snide-filled derogatory comments from a safe distance, rather than fighting dirty with the school bully.

There is a need to introduce some dissonance into the equation: some pain, grief, anxiety in retribution for any acts of scientific sabotage by the media.

We need to create a painful prerogative that if given the label cannot be worn as a badge of honour. In fact, it would be the opposite. It would make you smell, encourage the disdain of anyone you meet on your travels. (Well, we can try.)

We may be getting a way bit ambitious here, but the fundamental issue is that science and its efforts to build bridges with the outside world has been too nice, too middle class in its Blue Peter-type communication activities.

Perhaps, that is one of the things holding science back from popular engagement – it is too inherently middle class.

The history of science is populated with great figures from humble backgrounds – Michael Faraday is one of my personal favourites – who contribute to science. (An interest in him perhaps developed through reading about his life on the back of a PG Tips picture card.)

Yet personalities like Faraday become part of the establishment, not challenging it from a class perspective.

Unlike arts where you might get working-class poets you do not seem to get any 'working-class scientists' who are espousing their cause in populist language. Where are the celebrity outsiders of the scientific establishment?

One of the reasons that we do not have many celebrity scientists is because they do not have the equivalent of nemesis celebrities – people who they are in disagreement with, bitch about, or put down in public, to make the whole celebrity category of scientists interesting to the wider public.

Science needs to bite back. And it needs some words as ammunition to hit its targets with.

We need a term that is meme friendly and contains some dissonance.

No one likes being called, or labelled 'stupid'.

The web site www.urbandictionary.com already has a term, a potential meme we can adapt and harness. If you check out the word 'numpty' it contains a number of descriptions including:

'a scottish term, short for numb-skull' or 'an idiot, pratt, wally' and even an example of a usage: "away n'shite, ya fuckin' Numpty"

But I suggest we use the more refined definition:

'a person so stupid they are incapable of understanding the simplest of things'.

What if we were to create a variant of 'numpty' and punish any 'humanities-graduates-journalist-with-little-understanding-of-science-who-wear-their-ignorance-as-a-badge-of-honour' as a 'Numpti' which stands for:

'No Understanding of My Planet or Technology Idiot'

We could have the annual 'NUMPTI' awards to really drill home bad journalism and create pain. I can imagine university press officers when faced with a journalist with a potentially bad science angle to their story being warned off with the threat: *"You don't want to be labelled a Numpti here if you progress with this story..."*

We need to establish some quantitative measures and tracking to measure Numpti-nes among different media and individual journalists. There must be some university somewhere able to develop and manage the equivalent of the Richter scale for bad science journalism.

If the media and journalists know they are being monitored and be held to account, maybe then they will in turn be more accountable.

Instead of getting off Scot free they will have the shame of a Scottish term of abuse hanging around their necks.

Also, in the cause of upholding scientific integrity in media coverage we need to extend our repertoire of responses, the ammunition we use in response.

Using humour or satire can be more effective than the lengthiest polemic.

By pointing out the paradox or idiocy of a situation you can immediately deflate the other side's point of view, and build an instant bridge of rapport with the audience – as you are both laughing, sharing the joke.

As jokes are a form of story-telling, and in themselves can be a metaphor – they are memorable and pass-onable, making them more word-of-mouth friendly.

I like the response given by Sidney Perkowitz, Professor of Physics at Emory University, Georgia in responding to poor quality science used in films. He suggested a new mark of approval could be created to attach to future film credits which reads: *"No scientific ideas were seriously hurt during the making of this movie."* (Sidney is author of several popular books about science and also delivers a talk called: *'Hollywood Science: Good for Hollywood, Bad for Science'*.)

So, the way forward for science and building bridges with the outside world is less sanctimonious outrage - or nice Blue Peter campaigns working with the public, and more 'you-don't-mess-with-us-and-get-away-with-it' activity – plus a bit of fun and satire thrown in the mix, to really hit home.

As a young public relations executive I once had the pleasure of doing PR for Eric, a Bradford car salesman in a not-so-salubrious part of the city. He had his own forthright views on 'public relations' and told me that *"most PR is like a 'corporate wetsuit'"*.

I wish I had not asked him to define by what he meant by 'a corporate wet suit'. *"A corporate wet suit..."* confided Eric, *"...is that if you pee in it, it gives you a nice warm feeling!"*

Why is so much public understanding of science work like what Eric would call 'a corporate wet suit'?

Why are valuable resources used to reward people who will be doing good support of the cause of science anyway?

Science needs less Blue Peter or corporate wets suits. It needs to act more like 'Bradford Eric' with his talent for calling a spade a bloody shovel. Scientists

when dealing with a journalist pedalling a nonsensical science story should either take the piss, and parody their efforts through humour and grace, like Professor Perkowitz - or shove the 'Numpti' epithet where it hurts!

5. Science needs better quality memes – pass it on.

Do we need an equivalent of *'Top of the Pops'* – a hit parade of the top subjects listing the greatest topics and cause for concern of scientific illiteracy?

Such a chart, if well publicised, could give a useful steer and indeed a map for all of us engaged in tackling scientific illiteracy. Regularly updated it also creates for itself an episodic news story - it provides a news hook for stories about scientific illiteracy.

My own top five would include:

1. Climate change
2. Nuclear power
3. Patenting of DNA
4. Environmental impact on autism
5. Communicating with alien worlds – don't do it! (The history of humankind indicates that one of us will get a killer virus.)

We also need better quality memes in our campaign to make scientists aware of the issue of scientific bilateral illiteracy with some nice phrases they can use to promote their cause.

T-shirts with slogans like: *'Scientific illiteracy isn't smart'* can promote the need for non-scientists to smarten up on tackling their scientific illiteracy'.

We could do with some good metaphors too.

Metaphors are one of the most powerful communication tools going. They essentially consist of a message that operates on a number of separate levels. Take the example of Martin Luther King jnr; did he have a plan to tackle black unemployment with a 10% reduction over five years, or did he *'have a dream'*?

My good friend Graham Lewington, who has spent 21 years in the Molecular Imaging industry, working in both research and clinical applications adds this comment on his LinkedIn profile says: *"I firmly believe that current utilisation of PET technology has barely scraped the surface in terms of its potential - we are using a Formula 1 car to deliver milk!"*

He seems to be a rare animal – to use another metaphor- in the scientific community; how many scientists do you hear using metaphors?

Now, for anyone wanting a successful campaign to tackle scientific illiteracy, complete this sentence: *'For the average person not having a reasonable understanding of science is like a*'

6. Less hubris among the scientific community

We need less hubris among the scientific community.

The scientific community needs to redefine 'Public Understanding of Science' to the better starting point of 'Science Understanding the Public'.

The scientific community needs to recognise they are partly to blame for this situation, yet have the main responsibility for tackling this issue. Even if they do not accept 'blame', they are still the ones with the initial knowledge about science; it is up to them to take prime responsibility and do something about it. The responsibility for any effective communication always rests with the initiator not the receiver.

I am not seeking in this exercise to take pot-shots at a community, consisting of many decent, committed, and intelligent people. We face a situation where something needs to change to avoid getting the same results. This essay is a contribution, made in good faith, to challenge the status quo of bilateral scientific illiteracy.

Public ignorance is a blight the scientific community has learned to live with, tolerating it seems as long as they not persecuted like Galileo. From my experience, many actually quite like adopting a worldview that they are right when everyone else is wrong – it is probably what inspired them at school.

In my work I have come across many great communicators working in the field of 'public understanding of science' who are in effect translating the work of the scientists for wider public engagement.

Higher education has armies of talented and able public relations people. Museums have talented and able educational enablers engaging day-in, day-out with the outside world.

Yet they all face a fundamental mechanical difficulty in their work.

Their starting point is that the scientific fact is the epicentre of their world, the sole starting point for their task.

As a result the public understanding of science communicator is essentially a second-hand relayer of a messages; a scientist 'creates' some new science, and the public understanding of science people endeavour to translate this to the wider world.

They immediately are then bastardizing their source material. Any message they create is an echo, possibly a dilution or distortion of the original scientific fact.

This then creates a discord, a potential division with their masters of scientific knowledge.

To avoid this I would propose that communicators need to operate within a world which has two epicentres: in addition to their first epicentre of scientific knowledge, the second epicentre is the world which I will label, for want of a better term the 'Infosphere'. (I know some of my scientist friends label this the 'Ignorosphere'!)

Rather like the relationship between a fish and the water within which it lives the Infosphere world is the space within which people inter-act.

It is as if there is a parallel universe: one of scientific rational logic, and alongside it another world, that of the Infosphere.

The Infosphere is a world consisting of emotions/perceptions/episodic news framing/ and memes – where the basic principles of science, the scientific method, and key terms are not widely understood.

It is a world that many scientists seemingly do not get, or may be uncomfortable in engaging with. It is a bit like talking to a Russian speaking person in English and blaming them for not understanding you.

At the moment the process model for public understanding of science consists of:

Step 1 - this is the scientific 'fact'

Step 2 – the public understanding of science communicator asking the question: *'How do I translate it so other people can understand it?'*

We need however, a subtle but profoundly different process model consisting of three steps:

Step 1 - the scientific fact

Step 2 – recognition of the existence and realities of the Infosphere by both the scientist and the public understanding of science communicator.

Step 3 – within the twin context of the scientific fact and the world of the Infosphere the public understanding of science communicator asking the question: *'Now, how is this information about a scientific fact significant or relevant to others?'*

Sure, I can imagine the many good communicators working in the field of public understanding of science are now shouting out at me, saying that this is what they do anyway.

I would suggest not.

The reality of how they operate is they are work in an intuitive, instinctive way. They create an internal dialogue posing the question, *'How is this information about a scientific fact significant or relevant to others?'* They know about, and ask themselves this fundamental question, of how this information will be distorted within the Infosphere.

By internalizing their response, acting as a human translation machine, they can often do a very good job translating the science, building bridges with the wider world. They would be better served however, if at the outset, the context for effective communications, the reality of the Infosphere, is recognized by all parties.

The whole process needs to be more clearly set out. The scientists need to have an explicit recognition of the twin towers of human culture; the science and the cultural world of the Infosphere. To overcome the problems of silo thinking we need to install a second silo, a twin silo, to run ideas through.

The world of science needs to consider itself in a new paradigm; where 'fact' actually becomes recognised as discourse. Where the context of science production is openly acknowledged rather than presumed to be an empirical gathering of information relayed without inherent cultural or social baggage.

Science may - or may not be - purveying truths. The important point is that it needs to acknowledge that it is the creature of society and history, and also then plays into that society and sets the perspective for history to come.

The mission to explain needs to take a step backwards first, explaining to its client, in this case the scientist, something along the lines of *'before we go any further with this you need to understand how the outside world operates...'*

This might seem semantic, over fussy, or to some, stating the obvious. Yet, such a 3 Step process can create subtle yet profound new engagement

between communicators and their suppliers of scientific fact – the scientists, and subsequently, between these communicators and the wider world.

Using the 3 Step process, communicators working in science understanding of the public would be able to emphasise how they are not creating a distorted version of the science, but rather a new truth in the context of the worlds of Science and the Infosphere,.

Echoing the great newspaper editor C.P. Scott and his analysis of the gulf between "the two cultures" of humanities and the sciences, science understanding of the public should adopt a dualistic approach, a world of two epicentres: the world of the Scientific and the world of the Infosphere.

Any new information about science being presented to the wider world should have these parents. In this case, a two parent family really does work best.

Moving on from intellectual semantics we need to examine what I call in my branding workshops 'the T-Shirt Question'; what do you say on your T-shirt, in this instance, what is the sticky, snappy, word-of-mouth friendly phrases scientists should wear to promote greater understanding of science?

My suggestion for a campaign T shirt would read:

Scientific illiteracy – please help a scientist. OK!

My good friend, and beta reader, Geoff Roberts makes a further suggestion:

Scientists do it- but have difficulty describing how!

Other suggestions from another friend, who shall be called 'Dr. Hubris', include:

You're entitled to your opinion (but according to the evidence it's wrong)

Get back to Nature (or any other respectable peer-reviewed journal)

BEAM ME UP SCOTTY (I'm trapped in the ignorosphere with Max Clifford)

What's your suggestion for a T-shirt slogan about the scientific community needing to overcome its hubris?

7. Be nice to people – and people will be nice to you

And a final point, for scientists, along with bloggers everywhere. They both need a better mirror to help them build better bridges with the outside community.

They can gain a more accurate image of their real reflection by having a diversity health check of any of their on-line communities, a reality check on what different views are you really being exposed to, and are we guilty of any silo thinking?

In dealing with other people on the net perhaps there should be an updated version of any classic etiquette book for Victorian maidens.

The changing way people receive their news, with a declining use of traditional media and more use of new sources, such as blogs, opens-up opportunities.

During the MMR vaccine debates Ben Goldacre reviewed the media coverage on a new study. He noted how there was just one blog post commenting on it: *"on the lead researcher's boyfriend's blog (where he talked about how proud he was of his girlfriend)."*

A proliferation of blogs creating more widespread outlets, hopefully accommodating more diverse views, can be a valuable tool for promoting the cause of science.

Central to the whole debate of science and its reputation is respect; respect for others views, respect of the flaws inherent in the communications process - how sometimes what we want to say does not always come out the way we intended - and crucially a respect for the achievements and work of science and the scientific community, for the many good things in the world that wouldn't be here without them.

In fact most of us wouldn't be alive if it wasn't for the work of science.

Respect.

A new formula

I didn't initially intend to create a formula as part of this exercise to explore 'why science does not have the reputation it deserves'.

Yet, with some irony, my thoughts have crystallised into a formula capturing the key elements of the challenge.

My formula for getting science the reputation it deserves, and to tackle scientific illiteracy reads:

$$\textit{Science gets the reputation it deserves} = f \frac{K^3 + (ftxF^2) + (ftxT^2) + M^2 + V^3 + H > x G}{IS + IM + NT + Hu x E}$$

f is a function of

K = Universal basic foundation of scientific knowledge	IS = Ignorance of science
ft = flexible/flexibility in application	IM = Ignorance of media
F = Frames of thinking	NT = Narrow, silo Thinking
T = concepts of absolute Truths	Hu = Hubris
M = better engagement with Media	E = Electronic autism
V = Viral communications	
R = Recognition of problem	
H > = Humility and respect for other views	
G = Good work already being done	

The formula is intended to serve not as a definitive equation to the question but rather serve as guide in mathematical language, a metaphor, a form of shopping list of the actions and changes in behaviour that need to be done.

Something different needs to be done about changing the way we tackle scientific illiteracy.

Otherwise, if we keep doing the same thing, we keep getting the same thing.

I have called this essay 'Part I'. I have realised that I am still have much further to travel in addressing the question of does science have the reputation it deserve and with the challenge of tackling scientific illiteracy.

A Part II may be required to take on board the feedback, the further lessons learnt from any subsequent debate I hope to create - and any shortcomings in this initial analysis.

Reflecting on this exercise, it has been part catharsis, part bridge-building to make positive use of my experience and any new knowledge, and dare I say it, part fun; I have learnt more about science and its relationship with the wider world in writing this essay.

I will have to learn to live with my immense frustration that good causes, particularly those linked with mental health, have been deprived of a precious fund-raising opportunities by not harnessing 'Blue Monday' meme, thanks to the intervention of an influential group of scientists, using the so-called cause of science as their touchstone. (By the way, for any mental health campaign groups the 'Blue Monday' meme is still open and available for free hire.)

Perhaps, if the idea of 'Blue Card' thinking somehow takes off, then Blue Monday may curiously morph into providing a focal point for the scientific community to do more to create a better understanding of science. I am always a great believer you should never curse a child because of its parents.

Maybe in the same way as the legend of King Canute or the term 'Orwellian' are the opposite to their original meaning - Canute demonstrated he could not hold back the sea in order to demonstrate his human fallibility and yet is now popularly remembered for the opposite. Similarly, Orwell espoused libertarian egalitarianism and yet the term 'Orwellian' refers to a totalitarian nightmare - so the Blue Monday meme may evolve into a focal point of greater understanding of science or recognising bilateral scientific illiteracy.

We need a 'Blue Science Day' (or Week/Month/Year/Decade) – and it is not about rude facts or data by the way (although that could be a way of getting people engaged!) Rather, it is about popularising greater awareness about scientific illiteracy and taking constructive steps to do something about it, from both within the scientific community and crucially, from without.

I can see it now:

'BLUE Science, a campaign for 'science understanding of the public' is being launched to tackle the problem of scientific illiteracy, which is regarded by campaigners as a major challenge facing society.

The campaign aims to encourage non-scientists to become better consumers of science, junk science and pseudo science to avoid their being commercially

or politically exploited by encouraging scientists to become better communicators.

The initiative stands for Better Learning Understanding and Education of Science and unlike other initiatives seeking to achieve public understanding of science - this new campaign will work from outside of the scientific community.

It argues that some of the causes of misunderstanding of science are actually caused by the way scientists think, act and re-act. By coming at the issue as non-scientists it aims to tackle 'bilateral scientific illiteracy' – created by a failure by either side of the debate to fully understand the worldview of the other '

This exercise has also brought home to me an important lesson for us professional communicators. We spend our time and exercise our professional expertise at the hands of our paymasters, maximizing, amplifying the power and reach of their messages.

We need however, to go beyond this.

We need to also use our professional skills to amplify the unarticulated, the unsaid, the gaps in our media landscape we never get to hear about. Especially, when these gaps of unsaid contain the seeds of potential exploitation and empower the strong, or could even lead to the downfall of our society.

We do have a classic chicken and egg conundrum to this problem: Scientists have the knowledge, the understanding of scientific processes, which need to be explained to the wider world. They own the treasure but not solution to how you get other people to understand and engage with where necessary.

The paradox is that the very skills that equip scientists to gain greater scientific knowledge provide barriers to connecting with the outside world.

There is a need for non-scientists to take more of a lead in building the bridges between the outside world and science. We cannot just rely on the scientific community to make this happen.

As a professional communicator it has made me wake up to the unsaid challenge, to use my skills to give it sticky messages, and work back from where people are, to build bridges of communication.

I hope others in my field of work – specially the non scientists - will similarly do something too.

Our society faces real big issues we are not equipping ourselves to address. Science is increasingly used a socially divisive tool, with one group of citizens enjoying better privileges, rights and health – a scenario created because we failed to ensure an equality of access to understand the implications, potential benefits and negatives of scientific development.

We all need to do something to tackle bilateral scientific illiteracy – and it is going to take both sides of the divide to make a meaningful or worthwhile difference.

OK!

This is a free e book. In the spirit of Blue Monday, if you would like to make a donation to a mental health charity here are a few suggestions:

Depression Alliance
Mental health foundation
Samaritans
Comic Relief

Lastly. Thanks – to my dear friends who acted as beta readers and provided tough love, intelligent insight and responded positively, instead of raising their eyebrows and saying: *“What’s this latest Goliath he’s fighting this time?”*