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WARMING TO YOU –
FALLING FOR ME

*Draft for
Comment
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A DIALOG



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Dedication and Acknowledgements



Cover Painting by Peter Griffen:
<http://www.petergriffen.com/>

Introduction



Jane wants Bruce to explain climate change to her- but Bruce isn't sure that she is prepared for the kind of explanation that she thinks she wants.

Jane hasn't thought about science and maths for about 30 years. Her world has revolved around her passions of literature and art since primary school. Where can Bruce start? What will Jane really know when they get "there"?

Being busy with jobs (Jane's a part-time drama teacher; Bruce is some kind of scientist- we never get to know) and two pre-schoolers, they agree to take the time to explore the issue bit-by-bit.

Bruce has a plan- he wrote an essay on explaining and understanding science some years ago - here's a chance to try it out - eight simple steps from the concrete to the abstract and back again- just like steps on a chessboard.

This book is purely dialog. No description at all. Pillow talk, talk in the car on the way to Bruce's parent's farm, talk in a restaurant- wherever and whenever they can find a few minutes. Just talk.

The task is nowhere near as easy as Bruce thought it would be - Jane comes from a position of 'belief' and has her own take on the world. She loves Bruce, but his relentless 'empiricist probablist' approach to life can be exasperating. And when she thinks that she has a handle on Bruce's explanations, she re-frames it as a Shakespearean sonnet and sometimes a poem of her own.

To Jane's feigned occasional annoyance, they never actually get to discuss climate change at all- the journey becomes more interesting than the possible destination. They tour the ideas of ancient Greece, the Renaissance, the Enlightenment, the evolution of art in the nineteenth century, Alice in Wonderland and much more- two bright and willful people agreeing to try to understand each other across the classical divides of art and science, faith and reason, childhood and adulthood- and man and woman.

Most of the several thousand hyper-linked references are to Wikipedia. Why Wikipedia? Bruce explains his passion for the medium of the encyclopedia, which saved him from a fate as a farmhand. And it has a history- Alexandria's library, Diderot's Encyclopedie, Britannica, Richards... a window through which a light softly breaks....

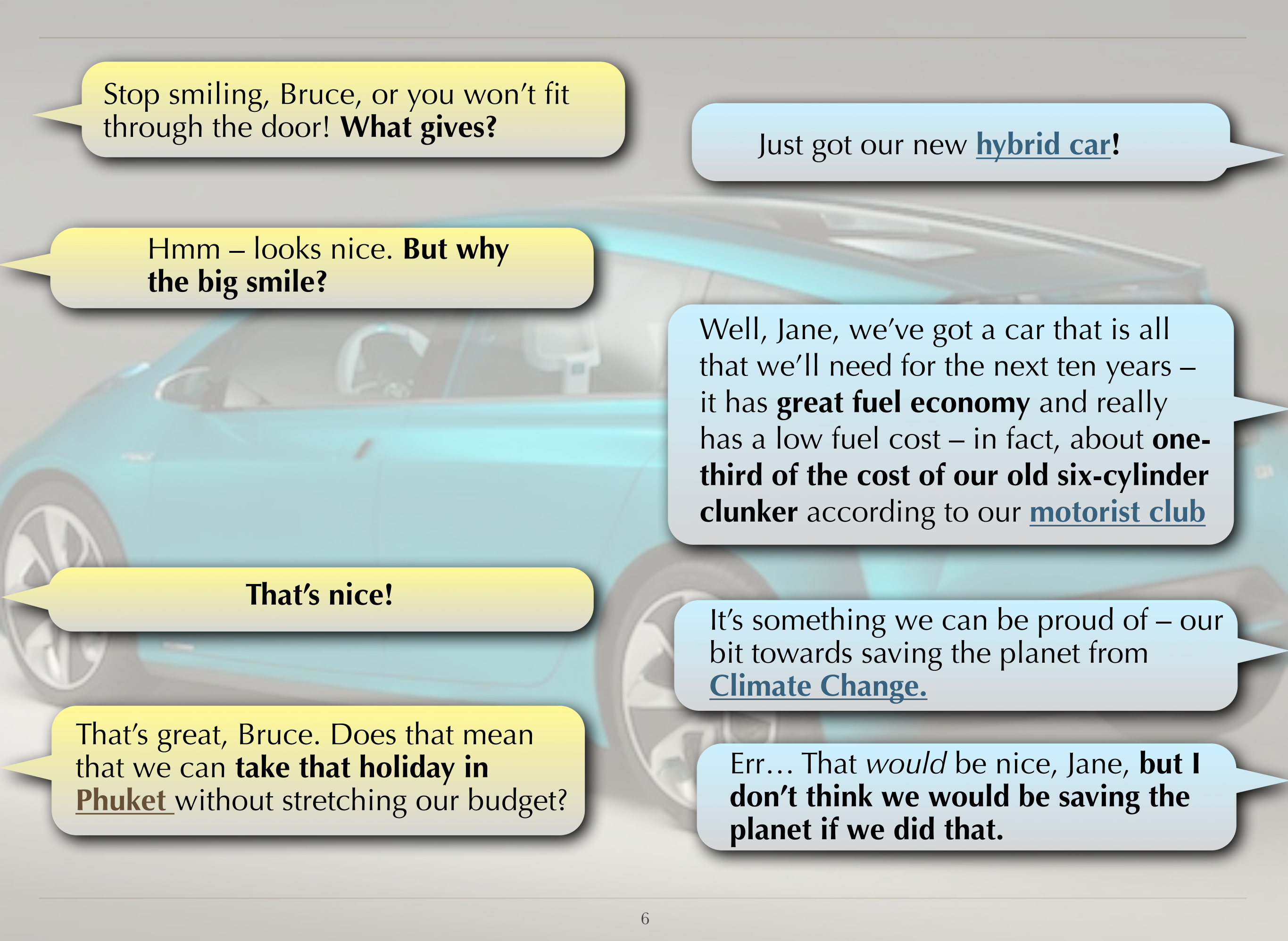
Chapter 1

MORE THAN WHAT WAS EXPECTED

In which Jane asks Bruce a simple question: Why not?
And so the inquiry begins...

Frontispiece (by [Stefano Della Bella](#)) to [Galileo Galilei's *Dialogue Concerning the Two Chief World Systems*](#), published by Giovanni Battista Landini in 1632 in Florence.





Stop smiling, Bruce, or you won't fit through the door! **What gives?**

Just got our new hybrid car!

Hmm – looks nice. **But why the big smile?**

Well, Jane, we've got a car that is all that we'll need for the next ten years – it has **great fuel economy** and really has a low fuel cost – in fact, about **one-third of the cost of our old six-cylinder clunker** according to our motorist club

That's nice!

It's something we can be proud of – our bit towards saving the planet from Climate Change.

That's great, Bruce. Does that mean that we can **take that holiday in Phuket** without stretching our budget?

Err... That *would* be nice, Jane, **but I don't think we would be saving the planet if we did that.**

Why not? Our carbon footprint to Phuket and back wouldn't be *that* much – **Wouldn't it?**

Why not? **Please explain!**

Try the short answer first, Bruce! You know that I've got a kind-of acquired attention deficit disorder.

The *short* answer, please, Bruce. **It's dealing with two pre-schoolers that's done it.** Without talk-back radio, I can't keep informed.

That's bloody typical! So obscure that only an **economics professor** could understand it.

Sounds plausible, Jane, but I figure that it doesn't work like that.

Well – there's a **short, simple answer**, but the **full explanation is quite lengthy**.

Yes – well – you do insist in listening to talk-back radio. **It's a wonder that you haven't acquired more than that!**

So much information – so little understanding! – But we won't go there. I'll just give you the short answer: Productivity **has got to be greater than production or we're all bugged.** How's that?

Isn't there anything **in between**? Like a *concerned-playgroup-parent's-conversation-length* explanation? Or a *dedicated-dog-walking-group-member's* explanation? **Like a couple of minutes, not just a couple of fancy words?**

But **that's different**, Bruce.



OK! OK! Point taken. But I'm sure that I could give you the **gist of it** in five minutes. Can't you do that with **climate change**?

New? Teachers have been explaining science for centuries, **surely?**

Well, you asked for an **answer**. An **answer** is **not necessarily an explanation**. That answer summarises it all, but I said that an **explanation could be quite lengthy**.

Hmm...Can you boil down your **master's thesis on Shakespeare's sonnets** into five minutes for me?

Sure, **Shakespeare** is different from **physics**, but I'm sure that **the problem is the same**.

Hmmm... dunno. We have a **real problem** here. It's the problem faced by scientists **every day now** – and I think that it is **actually a new problem** – at least at a **public level**.

Hmm.... go on....

..... and now...?

So what do *you* think is the **basic problem**, Bruce?

The **general population** used to believe – or at least **accept** – scientists' occasional public statements – probably because most of those statements were about science with **obvious economic or health or military benefits** – or some totally amazing and way-out discovery that was **useless and harmless**.

Every now and then the **media** would let a scientist **ramble on** in public and they **weren't really any the wiser**, but they were **comforted** because the scientists seemed **confident and in control**.

Now that the scientists are giving us **bad news** that we don't like, we don't want to accept their **ten-second sound bites** of discoveries, outcomes, results and findings and we – the public – still **haven't got the talent** to understand their lengthy explanations.

It's easy to boil down **fear, greed, doubt** and **anxiety** into **bumper-sticker-length statements**. But....

Isn't *that* a bumper sticker-sized sound bite? So – there's a **no-person's land in understanding** between **one hundred words** and **one hundred pages**?

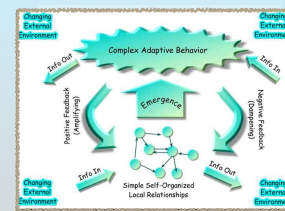
It's pretty well impossible to do that to a **acceptable scientific explanation**. **Flight will always prevail over fight** if we have the option.

Possibly, Jane. Even when one **simplifies** the explanation of a **significant theory** sufficiently to make it understandable to anyone even an **average high school science education**, there is the **danger** that it will **misrepresent** the science sufficiently that **unscrupulous** people can make a **plausible case that you are wrong**.

Is that **always** the case, Bruce?

So is there any way to deal with this **dilemma**, Bruce? **Can an explanation be both simple and true**?

So – do you think that you can **satisfy** me, Bruce?



This is particularly true of descriptions of **complex systems** such as **climate**.

I think that both *simple* and *true* are quite possible – but **one person's simplicity is often another person's difficulty**.

It seems that we are going to have difficulty getting beyond the **notion of simplicity**, Bruce. Are we going to get stuck at some **epistemological first base**?

I thought that it came **after third base** – when you **run home** – it did when we played softball at school.

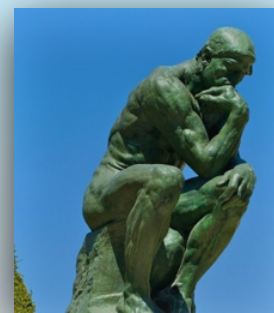
Oh! I thought I saw an **asterisk!**
What's the fine print?

Are you saying that I'm **unreasonable**, Bruce?

Well, Jane, **what comprises a satisfactory explanation** will depend on **how easily you are satisfied** or **how much else** you know about the subject.

Maybe even worse than that, Jane – **home base** comes before **first base!**

Yep – and baseball, too – it's both where you **start and finish**. Mmm.. Maybe there is some middle ground in explanation – but it does come with **a few basic conditions...**



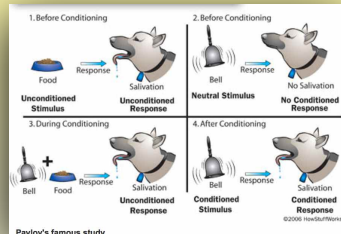
Well... **first** it needs you to keep your **reasoning** abilities switched on. By that, I mean you've got to be prepared to examine the **logical consistency** of your various beliefs and the **causal connections between them**.



No – not at all, Jane. More like **non-reasonable**, in a **scientific sense**. Your **reason** with regards to **moral and aesthetic matters** seems **fine**. I'm no literary or art expert and others have judged you there. But when you hear **quick comments** on matters related to **science** on the radio, or read the headlines in the **mainstream media** and they seem intuitively plausible and comforting, you take them in **without**

Well, I guess I did ask for it – **is there more?**

You're so sweet, Bruce. **I've never been compared to Pavlov's dog** before. You know that I really care about these things, but **my time is so fragmented** that it's a challenge to put two thoughts together.



Sorry – yes – those comments then **stick in your intuition-bank** – that part of memory that **Pavlov** used to demonstrate **conditioned reflexes** in **dogs**. And when somebody says the **trigger words**, you blurt out the **shock-jock** slogan or headline. Where science is involved, you often don't do a **consistency-check** between the latest statement and previous statements.

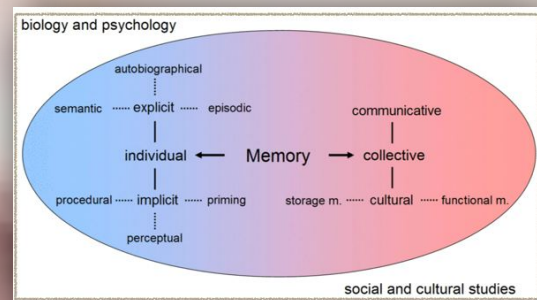
No offence meant, Jane – it's just the difference between a **behavioural** and a **cognitive** approach to these issues.

Y'know what it's like- **the kids yell and I've gotta run.**

Of course you've gotta **run** when the kids yell. The **media** plays on that same **basic reflex** – just that they **transfer** that very sensible **emotional reflex** into the **realm of public debate**. If it's not **fear**, then it's **greed** – the prospect of gain without pain.

You're starting to sound a bit **preachy**, now, Bruce! Let's stick to the subject. What are the other **conditions for understanding?**

Next- you've got to try to **remember things**. I know that it's not fashionable to have a good **memory** – although I know that **yours is pretty good** when it comes to **Shakespeare**. It's okay for the theatre and party tricks, but it seems that it's considered **rude** to point out that a **technical statement** somebody makes **today** is at odds with a statement they made **yesterday**.



But there's **so much stuff** out there. How can I remember all that stuff?

Well, there's a lot of **stuff** in the media, but **not really as much new, relevant or important stuff** as you might think. The first problem with memorizing is that all that **stuff** creates a **mental state** called '**backward masking**'.

Take me back to the ball, Bruce!

So how does *that* work, Bruce?

Are you sure that you're not being **paranoid**, Bruce?

Then what happened?

You really are **cynical**, Bruce!
That was a long time ago.

Well – the **next new stuff** comes so soon after the **last new stuff** that you don't get to form a conscious memory of it. But it can go **straight to your sub-conscious** so it can be triggered later. **Woof woof!**

No – I'm not paranoid – **they really are after me!** Or, more correctly, they're **after us**. All of us. These ideas were the **feedstock of psychology PhDs** in the 'fifties and 'sixties. It was just **interesting stuff**, then.

When they couldn't get jobs as academic researchers, **they went into marketing and advertising**. **Vance Packard** first alerted the world to this in his book **The Hidden Persuaders** in 1957. I suspect that **it did more to attract sharp minds into psychology schools** than it did to sharpen up **advertising regulators**.

Go on, Bruce....

More than **half a century on**, all of these techniques are bread and butter to **every large corporation and political party** – particularly those that employ or retain **public relations and media management people**, which is most of them. These people are now taught in the *Communications and Media schools* – they don't even call it *psychology* any more.

Sounds grim...

It's like the link between **physics and engineering** – but in this case it's **psychology and mind-engineering**. More than half the stuff that you read and hear in the public media is **straight from these people** even if it looks like edited news.

You're making it sound like [Nineteen Eighty Four](#), Bruce.

On reflection, they're not **after** all of us – they've **already** got most of us. They're just mopping up the **dissidents and intellectuals** now. When did someone in the play-group utter anything more than a cliché or [meme](#)? And, I'd say that your playgroup friends are amongst the most **well-educated** in the country.

But let's not get bogged down. So I need a **pinch of reasoning** and a **good dose of memory**. I got A's and B's at high school and uni. Even **got a prize in third year English Lit** for the most original semester essay.

Steady, Bruce. We learnt our multiplication tables by **chanting** first thing in the morning. I'm **hard-wired** with them now.

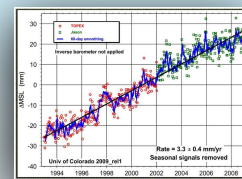
Hmmm.... Well, OK. I used to do a quick check on **value-for-money** at the supermarket – you know how **every brand is a different size and price** – these days it's all there on the price tag – **unit pricing**. No need to use my tables. Thanks.

And the pollies? – you can't believe anything they say, anyway, so why try to make sense of their extravagant statements. **They are probably don't understand their own words.**

Well, **you've got all that you need**, then, Jane. Can you remember your **times tables** from primary school and **graphing** from high school?

Just asking, Jane – but do you ever **use them**? Like – do you do a **guesstimate** of the cost of groceries or apply them when a **politician mouths off** about billions of dollars wasted on some **public project**?

And the pollies?



I rest my case regarding media managers. **What about graphs?** Do the **finance reports** make any sense to you on the **TV news**?

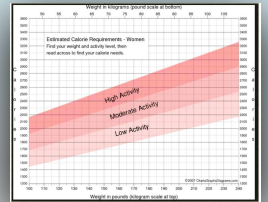
Graphs! TV! That's generally when I'm putting the kids to bed – OK – I know that we both share putting the kids down. Those reporters are **so quick and slick** that you haven't got time to really take it in. Most of it is **financial gobbledegook**.

Just don't go there, Bruce! I guess if I had the **time** to sit and look at a graph, I know how to sort it out. Just getting the **time...**

I know that one! It's the skill that enables you to interpret a modern **hyperlinked movie** or **soapie** with its **rapid change of scenes, parallel stories and twisted plots!**

Anything else? This started with your smiling because of our new hybrid car. **I wasn't expecting the Spanish Inquisition.**

Maybe so, but do you get the **gist of what a graph is?** You know – how some quantity varies against another varying quantity. **Like weight gained versus calories consumed....**



Fair enough! You know that I'm pretty good at that kind of thing, but **I wasn't born programmed with graph-knowledge**. Sure, I might have more than average basic abilities, but most of it comes from **practice**, like most other **skills**. It's called **visual literacy**.

That's right, Jane! We **integrate** them in our mind because they are **visual clichés – abbreviations** of things that we have seen at length before. Like the kids with their music lessons – **it takes practice**.

Nobody does! So that's just **three things** that you need to understand all this stuff on **climate change...**

Just **three** things, Bruce?

Very droll! I know – *fourth* – you need a bit of time....



Maybe it'll come to that! The kids are having their afternoon nap, so I've probably got another **five minutes** before I'm interrupted by something or somebody. **The clock's ticking – now!**

*“Yet be most proud of that which I compile,
Whose influence is thine, and born of thee:
In others' works thou dost but mend the style,
And arts with thy sweet graces graced be;
But thou art all my art, and dost advance
As high as learning, my rude ignorance”*

Yep! **One** – elementary reason and logic; **Two** – some capacity to remember; **Three** – a ninth-grade ability at arithmetic and graphs- and **Four...** There are **four** things that you need.....

Exactly! So...what about a series of **five-minute Scenes**? Despite the years of **media grabs**, there's a lot missing from the public discussion. Do you really want to **understand**, or just get by on **plausible clichés**?

OK, darling, here's the **first five minute chunk**. You can take it away and chew on it until we've got another five-minute **window of opportunity**.....

Sonnet 78



OK! Let's start, Jane!

Chapter 2

TRUST

Camille Flammarion
(1842 – 1925): *The*
Flammarion Engraving
(1888)



Well, Bruce, what I understand is that there are claims that the climate is changing very rapidly due to human activity and counterclaims that this is doubtful – and besides – *the climate has always changed*, so **what's new?**

I know that we've recently seen a **long drought** in Australia that broke with record floods – and then **fires** – and most other countries seem to have **dramatic changes in weather** as long as I can remember. So – **what do we mean by climate change** and **how do we know that we're responsible?**

Well – I've got a problem, Bruce: **I'm prepared to believe** that we're causing climate change on the basis that **you believe** it and I trust your judgment on this because you've been looking at this for a long time. But I'm *not* prepared to say *that* to my friends – **I need my own response**. **What do I say?**

OK, Jane – the kids are watching a video and your fair-trade/soy/low-GI'd coffee is poured. **Where would you like to start?**

New? It all depends on what you mean by *new*. **What do you want to know?**

Hmm... again, Jane, **a short answer is possible**, but it may not satisfy you and a satisfying answer could be a lengthy journey. **It all depends on whether you want to take the journey.**

I can see your **dilemma**, Jane. It doesn't seem to be politically correct to **refer to expertise** in others – particularly one's partner. But first, Jane, let's pause and look at that word *believe*.

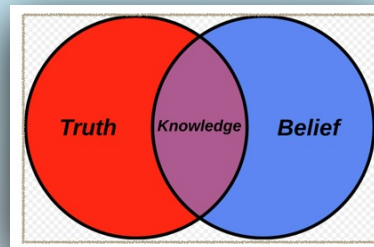
I don't *believe* in human-induced climate change, or anthropogenic global warming – **AGW** as it's often called. In fact **I'm not sure that I believe in much at all...**

Oh?

Aren't you being a **bit pedantic**, Bruce? How would you describe **your view**, then?



....other than I **believe** that **I love you and the kids** and I believe that trying to make a **sustainable planet is worthwhile**. Belief is slippery notion, but I take it to mean *a basic or fundamental view that I am not prepared to surrender, that may – or may not – be based on any evidence*.



I prefer to say that something – say AGW – *seems to be very likely, based on the available evidence and more likely than other plausible explanations*. To me, if someone says that they *believe* something or *don't believe* something, then I wonder **whether it is worthwhile continuing the discussion with them**.

More likely! Very likely! Isn't that the same as *belief*?

Not at all, Jane. **Beliefs** are **fixed mental positions** that are immune from change by what we call empirical evidence.

That's a **bit strong**, Bruce. I don't think that everyone is saying that they'll **die in a ditch over everything that they say they believe**. Religion and gurus aside, I think that most people use the word *believe* when they mean **this is the present position that I'm taking on this particular matter**. Why they take that position is another matter.

Well, I hope that *I* can. I said that I **trust** your judgment on this subject, so I'm prepared to **accept** your comments – so long as I can have **some foundation of information to build on**.

I think we're in danger of going **backwards** in this conversation, Bruce. *Climate change* seems to be receding from view. **Trust is trust – isn't it?**

You've got one minute on trust, Bruce, and then back to **climate change**. I know that kids' video backwards – it's got less than five minutes to run before the kids start **bugging each other**.

.... So if someone **believes** in AGW, God or some guru or wise person, the best we can do is have a 'yes-yes' conversation. **Disagreement is pointless**.

I agree that it may be so in **some cases**, Jane – but in **many cases** that *present position* **never changes** – maybe because **they don't know how to change**.

Hmmm... the word *trust* also hits my **hot button**. **What are you trusting** when you say that you *trust me*?

Not quite. I doubt that we'll make much progress unless we can make sure that we have agreement on **a few of these words that we throw around so loosely**.

...and the **difference** being?

So when we say that **we don't trust politicians**, then we're probably talking about **both kinds of trust**?

Well, Bruce, **our relationship** is based on the first type – **intentional trust**, and on the matter of *climate change*, I trust your competency on *that* more than I do on birthdays. Four minutes left – **how do I start explaining climate change to the playgroup?**

So **which kind of trust** do we accord to **scientists**?

One minute? OK! there's a lot that can be said about trust, but for the moment, we are interested in **intentional trust and competency trust**.

Well... it's like this: If you say that you trust me to **tell you the truth**, then that's **intentional trust** – it's a **moral** issue. If you say that you can't trust me to **remember your mother's birthday**, then that's **competency trust** – that's a **technical** issue.

They sometimes **shade the truth** when they actually know something and often they don't know what they're talking about. Then they accuse each other of being *untrustworthy*. **I think that it's useless to trust someone's intentions if they don't know the relevant facts.** They might *sincerely* take us to hell.

Maybe if you use the issue of **trust** with them. We all know that a lot of scientists agree that the climate is changing due to carbon-dioxide and other pollutants **generated by human activity.**

Safety in numbers! Always numbers! So **what are the numbers here, Bruce?**

Aren't they just **following the fashion and the money?**

And what about the **conspiracy theories?**

Bruce – six hundred years ago probably 97% of people believed that the **Earth was flat**. **The majority *can* be wrong!**

For scientists, I think that we don't need to go past **competency trust**- there's **so many of them**. **Collectively**, all the individual technical errors tend to be removed and any **intentional trust** problems gets pushed aside very swiftly.

How many climate scientists? I'm not sure, but there are **many thousands**. And reliable **surveys** have found that **97-98%** of them support the tenets of AGW outlined by the **Intergovernmental Panel on Climate Change**.

Hardly! Climate change has been researched intensively since the early 1970s – **more than 40 years**. And there is also plenty of evidence that the 97% of **supporters** are **far more competent** at climatology than the 3% of **doubters**.

Are we going to trust **that** much competency – **or are they very competent in sustaining a conspiracy over dozens of countries over that period of time?** Or are we going to trust the **less-competent 2-3%** who disagree with them – along with some prominent people who are **not competent climatologists?**

Oh? **Christopher Columbus?**
Queen Isabella of Spain?
You know the story, Bruce.



Oh! The **flat earth thing!** Interesting point, Jane – and a **point that is wrong.**

One of the most **enduring myths** in history, Jane – practically **nobody** since the time of **Aristotle** has considered the Earth to be flat – at least nobody of public consequence. It's a myth with a tenuous history, but one that is **used frequently by climate-change doubters to try to undermine the scientific consensus.**



So how did the idea get any **traction**, Bruce?

But I don't think that the **peasants** had much to do with promoting the myth.

What! Another **conspiracy theory?**

Just think about **Medieval** and early-**Renaissance** times. For most people, the Earth was, for all intents and purposes, flat. They never went more than a few kilometres from home. It didn't matter and they probably didn't care – **the local hills and dales were the limit of their world.**

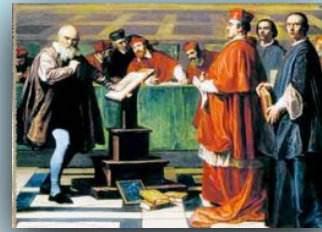
A few of them – **princes and popes mainly** – had a **vested interest in saying that the Earth was flat** because they couldn't fit a **spherical-Earth model** into the rest of their world-view even though it had been around for thousands of years.....

Where's the evidence, Bruce?

So – leaving aside for the moment the **pillage and plunder** that ensued from his adventures, **did Columbus make any difference** to the debate about the shape and nature of the Earth?



Sounds like he was **competent**, even if his **intentions** weren't pure!



Just look at the grief that **Galileo** suffered 400 years ago at the hands of popes and princes. They had the **power**, so their **word was rule**. I'm sure a lot of people in those times said *the hills go up and down, but that doesn't mean that the world isn't basically flat*. These days, lots of people say *the weather goes up down but that doesn't mean that the climate is changing* – that's the modern flat-Earth view.



He probably did, Jane. Up Until then, most of the argument was based on fairly **local experience** – you didn't have to go very far out to sea to notice the buildings and trees near the shore disappearing from sight – and some rather ingenious calculations of the Earth's diameter **had been made for over two thousand years**. But it was **Columbus**, as the story goes, who was the **scientist** in this matter – the *empiricist* – he was the one who went out and **tested** the curved-Earth theory.

Before you get onto your bike about monarchies and papacies, Bruce – **could you make the connection to the present issue?**

Columbus wouldn't have thought of himself as a scientist, but he **tested his ideas** over large distances – compared with the distances familiar to most people. **Others followed and reported the same findings as Columbus** – to the benefit of those same-said princes and popes. **That's how science works!**

Okay, Bruce – I'll buy that one – **but what about Y2K then?** As I recall, thousands of technical people believed that **catastrophes were imminent** if we didn't check out every computer's calendars before the turn of the Millennium.



Most certainly, Jane. Climatologists have tested their ideas over long periods of time – **greater than personal experience**. The 97% of scientists today are all *Christopher Colum-buses* and [Vasco da Gama's](#), to extend the analogy. **Empiricism rules – OK!**

Yes, the [Y2K](#) is often raised as **being comparable to climate change**, because **both involve the opinions of a lot of technical people**. There are big differences – leaving aside **allegations related to intentional trust and competency trust** – a lot of people made a lot of money over Y2K. It was more about [risk](#) – **the potential or possibility of loss** – and the *time* available to minimize the risk. [Risk management](#) was a pretty new idea in the late-'nineties and even mentioning the word *risk* **frightened people**.

Now you're throwing around words that sound much the same to me – **possible** and **probable** – but you're making a lot of a **fine distinction**, aren't you?

Physically Possible

It's an important distinction, Jane - one that the **doubt-ers** wish to blur. To say that something is **possible** is to say that it is **not impossible** - in that if it did actually happen, it would not defy the **laws of physics**, as we know them - and even if it did, **we would be prepared to review our understanding of the laws of physics.**

.6

Raw Data

And **probable**, Bruce?

Rather **difficult to define**, Jane. A lot of definitions simply say that the **probability** of an event happening is the **likelihood** of it happening. That's almost a **tautology** - but the word **likely** is often used **subjectively**.....

Like - it's almost **bound** to happen? Hmm.. I can see now that it's a bit **slippery**.

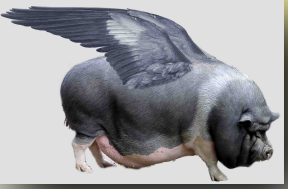
Indeed, Jane - We can make mathematical **estimates** of probability, but practically, we can only say that '**in our experience**, this kind of outcome has happened about **so-many times in every hundred comparable events.**



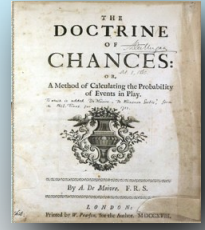
So you don't rule anything out **entirely**?

Nope!

Then miracles **can** happen?



Possibly!



Groan!

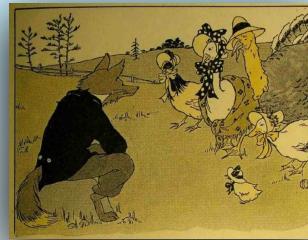
I think I've now got the hang of the difference between possibilities and probabilities. **So where does that leave the Y2K schemozzle?**

But what went wrong with Y2K?

So what's the difference between that and climate change, Bruce?

So, in summary – **what's my one-liner?** I can hear the end-music on the kids' video.

What they were trying to say was that there was **a small – but *real* – probability that computer errors could lead to catastrophic results** – like planes crashing or nuclear power plants malfunctioning.



As I said, it was all done in a rush – a couple of years – and **panic prevailed over rational risk assessment**. It was **Chicken Little Syndrome meets China Syndrome** – the likelihood was small but the consequences of failure *could* have been large.

There were many allegations of failure of both **intentional trust and competency trust** – and there probably were plenty of instances of that – but I think that the biggest problem was **the lack of *time* to make a better assessment**. When somebody yells *fire* in the theatre, we assume both intentional trust and competency trust – **and run for the door**.

AGW has been looked at by thousands of very qualified scientists for over 40 years. They are saying that there is a problem, but we have a few decades to fix it. **There is a *fire*, but there's no need to panic** – we can move in an orderly way to the door, so to speak. But we've got to get moving. **Y2K was a panic**.

So what's my one-liner, Bruce?

It's this: *Who do you trust?* – thousands of scientists with forty years of heavily scrutinized research, or a handful of scientists backed by carbon-companies? Would you take our new hybrid to a backstreet mechanic? **Where would you place your bets?**

*How careful was I when I took my way,
Each trifle under truest bars to thrust,
That to my use it might unused stay
From hands of falsehood, in sure wards of trust!
But thou, to whom my jewels trifles are,
Most worthy comfort, now my greatest grief,
Thou best of dearest, and mine only care,
Art left the prey of every vulgar thief.
Thee have I not locked up in any chest,
Save where thou art not, though I feel thou art,
Within the gentle closure of my breast,
From whence at pleasure thou mayst come and part;
And even thence thou wilt be stol'n I fear,
For truth proves thievish for a prize so dear.*



.....End Scene 2

Chapter 3

KEEPING IT SIMPLE

...In which Jane and Bruce engage in a few minutes of pillow talk about their different approaches to “The Truth”. Bruce has a close shave so it all finishes quite smoothly.....



Ahh! **An early night!** That gives us a few minutes to chat about **climate change** before going to sleep. I'd like to get some hard information from you, Bruce, but first, **I want to know a bit more about scientists.**

They seem to be getting a bad rap these days that **makes them sound like a bunch of conspiring crooks.** I'm sure that it can't be as bad as that – otherwise you wouldn't hang around with them, but they seem to present themselves as something special – I'd like to know **what's so special about scientists that gives them a greater claim to believability?**

They're not a very loveable lot – they seem either *shy* or *arrogant* and often don't speak in everyday English. **How can we trust a bunch like that?**

Maybe – but they sure make it hard to get at. Why? **Don't they realize what game they're in?**

What would you like to know, Jane?

What's your problem with them, Jane?

A bit of a **generalisation**, Jane – but I agree that there are plenty of public examples to point to. Where to start in defending them? **Should I be defending them?** Well – yes, because, ultimately, when you strip away their façade, you'll find **above-average trustworthiness** – both *intentional* and *competency* trust.



And what **game** is that, Jane?

The game of **winning hearts and minds** – or minds and hearts – getting people to *understand your ideas and believe them*. That's what everybody else is doing – you've **gotta sell your product** – it's a **crowded market of ideas!** out there.

What's *obvious* about science? When it comes to science, there seems to be only **two sorts of people in the world** – **scientists**, who all nod knowingly at each other when they talk, **and the rest of us**, who find science almost totally **inaccessible**. I don't think that the 97% are wrong on that one.

Tell me – what on earth do they think is so 'obvious' that they don't need to bother to explain to **us mere mortals?**

The *truth*... huh?.....

Most of them **don't think about science in those terms**, Jane – they think that their product should sell itself, **because it's obvious**.

Hmmm....



The truth, my dear Jane, the *truth*. That's what they think is obvious. In their view, they are telling the *unvarnished truth*. **There is no place in science for deceit**, so when they speak they assume that others will respect the fact that they are **not hedging the truth**. They **aspire to one hundred percent intentional trust** – even if their **competence** is less than perfect.

*When my love swears that she is made of truth,
I do believe her, though I know she lies,
That she might think me some untutored youth
Unlearnèd in the world's false subtleties...*



Oh! What is that?

The beginning of [Shakespeare's Sonnet 138](#).

And I wish that I could quote science like you do. **Maybe we're not as far apart in our understanding as we first thought.**

Hmm... in a nutshell – *convenient lies will always prevail over [inconvenient truths](#).*

Basically, the relationship between these two lovers is one of **mutual dishonesty**. He's much older than she is. He wants to appear younger, while **she wants to think that she is with a more youthful lover.**

Indeed, but there is [much more to the sonnet](#) than that.....



Very nice, Jane. I wish that I could quote Shakespeare like that. **I guess that's your forte.**

I don't know. I haven't a good ear for Shakespearean English. **What was he on about?**

That sounds familiar! **But how so?**



Well – so long as they are **consenting adults** and nobody else gets harmed, I'd say that they are responsible for the outcomes of their **mutual deceit.**

And what's the **lesson in the digression**, Bruce?

I bet there is – at least one master's thesis – and probably a library full of them. I think that this is a **beautiful and instructive digression**.

Whose world, Bruce?



To me, the **important difference** between what I have heard of **Sonnet 138 and science** is that so long as the couple wish to continue to **kid each other**, they'll get along, notwithstanding their internal torments – **but science is not science unless ideas and thoughts are tested against the *external* world.**

Everyone's?

Everyone's, Jane.

Yep! No one's excluded – **so long as they follow the rules.**

Rules, eh? So **science is a game**, after all!

Maybe – **if you call *life* a game.**

Wow! **Heaaavvvy!** Statements like that could **vaporize our whole discussion!**

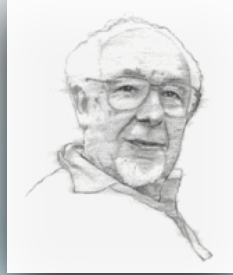
Ooops! Your call!

I don't give up easily- **but can you bring it to bear on science and climate change in one easy step?**

An agreeable sort of fellow?

I'm sure that **Shakespeare** would have said the same about *his* writing – **but it's nothing like science** – as far as I can tell.

Point taken, Bruce – but let's try to stay on – or close to – the **scientific track**. I heard the words **true goal** and *consensus of universally accepted knowledge*. **Truth and consensus don't necessarily go together** – we talked about Christopher Columbus before. **How do you wriggle out of that?**



I wondered when you'd ask me, Jane. Sure – science has been described as 'public knowledge'. [John Ziman](#), an English-born physicist coined that description. Professor Ziman argued that the true goal of all scientific research is **to contribute to the [consensus](#) of universally accepted knowledge**.

Ziman was really a great communicator – he said that ***all genuine scientific procedures of thought and argument are essentially the same as those of everyday life***.

Shakespeare seems like a **rather different approach** to everyday thoughts and procedures than science – as far as I can tell.

Well, as I said before, as far as we can tell from the [historical record](#), most people who **thought** about the earth's shape probably thought that it was a sphere. **But most people didn't think about it much at all** and probably **assumed that it was flattish**, so I suppose that you are right – the majority weren't round-earth advocates. I think that the **key word** here is actually '[knowledge](#)'.

I can hear a **giant sucking sound** of us disappearing into a **semantic vortex**. Get out of this one – and quickly – [Indiana Jones](#)

We're getting closer to the edge of the vortex – quick!

I'd prefer **quick to fancy** with this one, Bruce. Our **semantic canoe** is starting to go 'round and 'round.

Talk about **tangential mental forces!** But wait! They aren't on the shore, yet – they're actually on a rock with swift currents between themselves and the shore. **And there's an alligator in the way, too!**

They might be on dry land but *you* aren't yet. **Where's the connection to science in all this roudiness?**

Right on, Jane! **Indiana Jones to the rescue!** Now there's someone I really admire – an **intellectual as well as a man of action!**

Yep! Knowledge seems to come in **two basic flavours** – *words* and *action*. **Descriptive knowledge** and **procedural knowledge** if you want to be fancy.

Well, here's Indiana Jones's **overhanging branch** at the edge of the whirlpool: He's a man of **knowledge and a man of action** – he *knows* what actions to take and importantly, **how to take them** – to him, *true knowledge* is **procedural** – it's a **capacity to act** – and that capacity is only **believed** to exist if it is **demonstrated** – no waffling, no overblown claims! He knows how to flick his whip around the overhanging branch and let the **near-tangential forces** push the boat towards the shore. Whhhhhipppp! **QED!**

Easy! He picks her up and nimbly treads on the slow-witted alligator. Presto! **Dry land.**

Is it ethical to **experiment with alligators** like that?

OK! I feel that we've been sucked into that vortex and out into an **alternative universe**....

No! – that was another Harrison Ford movie, Bruce. **Meanwhile, back on Earth...**

Oh! – I wondered what that little asterisk was – '**conditions apply**'. What are the conditions, my love?

It's like this, Jane: Indiana Jones went to whip-school, studied fluid dynamics and saurian biology. **All before breakfast.** But importantly, he is an empiricist – **he only accepts those things that are tried and tested.** He might experiment out in the realms of low-probability events, but he'd never have survived to make the movie sequels if his knowledge wasn't **grounded in the knowledge of the scientists that went before him.**

Just as ethical as it is to experiment with **alligator-hopping scientists.** Read the small-print in the credits: 'No animals were harmed...'

....The Empiricists strike back!

Well, the point is that **science is about what works** – with some conditions...

Hmmm... Let's see. **There're five. First,** empirical science – or **empiricism** – **only relates to what we can perceive through our five senses.** **Secondly,** there must be **agreement** – **my perceptions might be delusions**.....

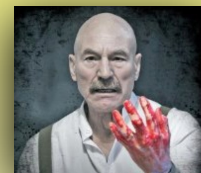
Hmm... maybe... and *number two*?

So much for the Post-modern movement... and *three*?

*Proof and ..disproof...OK... Well, finish your sentences first and then I'll give my verdict. ..and *four*?*

*'Is this a dagger which I see before me,
The handle toward my hand? Come, let
me clutch thee.
I have thee not, and yet I see thee still.
Art thou not, fatal vision, sensible
To feeling as to sight? or art thou but
A dagger of the mind, a false creation,
Proceeding from the heat-oppressed brain?'*

Can *I clasp* Ockham's Razor, Bruce?



Secondly, there must be **agreement** – my perceptions *might* be **delusions** – other people have got to agree that *their* perceptions, with regards to the subject at hand, **are much the same as mine**. That's the **public knowledge** part.

Next, any generalized statements – that is, 'theories' about my perceptions – **must be testable and refutable** – that last bit's really important – ***it must be amenable to disproof***.

Then there's the Ockham's Razor bit....

Well, **Macbeth** wasn't much of an empiricist – **he was *deluded***, I know *that* much Shakespeare.

Well done, darling. Now cut to the chase. **What's Ockham on about?**

Uh?

A clash of daggers! **Could you bring it down to earth?**

Oh – the **KISS principle**. Why didn't you say so before, Bruce?

Sounds reasonable. Any other fine print for empiricism?
Number five?

Entities must not be multiplied beyond necessity.



It's the law of succinctness – it's a principle that generally recommends selecting the **competing hypothesis or theory** that makes the **fewest new assumptions**, when the hypotheses are equal in other respects..... for instance, if all the hypotheses can sufficiently explain the observed data.

For example, a **spherical earth makes for a more succinct explanation than a flat earth.**

Because **KISS might fail the Ockham's test** – if it's *too* brief to cover the whole principle. **You can boil things down only so far.** But, yes, it's the KISS principle of science.

Yes...**five** – that we **tacitly accept reason and causality**. There's no place for saying '**then a miracle occurs**'. **The chain of logic and reason can't be broken.**

Pretty cruel conditions.
Not much room for romance, is there?

Cruel – but fair. They apply to everyone.
No exceptions.

What about a kiss good-night?



You can multiply it beyond necessity if you like, Bruce.
There are no conditions!

An *Ockham's* kiss?

*How oft when thou, my music, music play'st,
Upon that blessed wood whose motion sounds
With thy sweet fingers when thou gently sway'st
The wiry concord that mine ear confounds,
Do I envy those jacks that nimble leap,
To kiss the tender inward of thy hand,
Whilst my poor lips which should that harvest
reap,
At the wood's boldness by thee blushing stand!
To be so tickled, they would change their state
And situation with those dancing chips,
O'er whom thy fingers walk with gentle gait,
Making dead wood more bless'd than living lips.
Since saucy jacks so happy are in this,
Give them thy fingers, me thy lips to kiss.*



Chapter 4

A THOROUGHLY POST- MODERN MILLENNIUM

In which Bruce and Jane wake early. Bruce laments the passing of the era of the Salon, while Jane reflects on the practical views of her day-care associates. It finally dawns on both of them....

***Irresistible Force and
Immoveable Object***

– photo by the Author



Are you awake, Bruce?

I think that the heavy rain on our tin roof woke me and I've been lying here for a while. **I was dreaming about climate change**, and all those bearded young scientists and *Ockham's Razor*..... **and ants**, for some reason.

'To sleep, perchance to dream – ay, there's the rub.' Poor ol' Hamlet. It's a pity that we can't share dreams.

Hmmm... that would be nice. I was going to lie here and snuggle up to you and doze, Bruce, but it looks like **we're both wide awake**. The kids are still in dreamland and the alarm won't go off for another half an hour. I'm still avoiding talking much to other play-groupers about climate change stuff **because I still don't know anything about the subject that is more than a media-cliché**.

Yeah, can't you sleep, either?

I'm sure Shakespeare had a lot to say about the subject.

.....But we can share **visions** and **points of view**, Jane.

I'm sorry if **I seemed to have digressed**, Jane. I thought that it was important for you to have **some feeling for the scientific context of this issue**. There's a big gap between the **media-cliches** – as you call them – and the **conversations** that scientists are having. I'm not trying to humble you by setting scientists up as demigods, **nor am I trying to turn you into a scientist**. You're already a **goddess** as far as I'm concerned.

You're so sweet, Bruce.

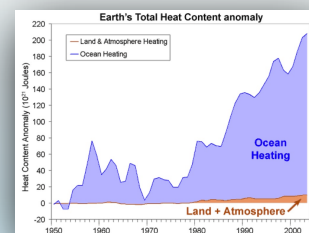
Unfortunately I can't take my one-person fan club to play-group – some of those play-group parents are **pretty opinionated** – and **their strongest opinion is that they are entitled to their own strong opinions**, although they sound like the **strong opinions of the shock-jocks**.

I must say that **facts are few and far between. Disconnected snippets** as far as I can tell, Bruce. Claims like *in fact the earth has been cooling since 1998*, like *in fact we breathe out high concentrations of CO2*, so how can a fraction of a percent of CO2 in the atmosphere is going to change anything, like...

The curious thing is that they **seem to be sensible and nice people**, but with this **hot button** on climate change. They'll readily discuss the plot and production values of art-house movies, the literary worth of the latest best-seller, even the relative merits of the range of SUVs. **It's a mystery.**



Isn't democracy wonderful, Jane. **Everybody is entitled to their own opinions**. But are they **entitled to their own facts**?



...Yep, I've heard all of those 'facts' so many times, Jane. I'm not sure whether people that spout these 'facts' are **amenable to sensible discussion** anyway.

Perhaps that's the clue, Jane – **they're sensible and nice people.**

Uh? **Nice** isn't *nice*?

Coherent conversation?

Errr.....

....And when did you last hear someone talk on something for more than a **few seconds before someone else chimed in?**

Well... there was.....hmm...

Wow! All that at 5.43am! No need for morning coffee around you, Bruce!

Ummm....

That's what so-called *sensible* and *nice* people do these days. Just think of it: When did you last have a **coherent conversation** with the play-group parents, or in the dog-walking group, or **even at dinner at a restaurant with friends?**

By *coherent*, I mean where a statement made by one person is **acknowledged and responded to** in a way **that actually builds on that statement.**



.... It seems to me that social conversation has developed a style that's like an **audio-kaleidoscope** – lots of colourful fragments contained by mirrors that **give the illusion of pattern and coherence. A cacophany!**

Thanks for that compliment, Jane. **That was a compliment – wasn't it?**



But it's **very frustrating**, Jane – it almost seems like a collective rejection of the virtues of *reasoned discourse*. I used to read about the salons of the eighteenth century where **modern science** was created – **I dream of their return.**

Welcome to the post-modern world, Bruce!

I had a hunch that you would think it a dirty word, seeing that post-modernists would **probably view you as modernist.**

I love it when you **talk dirty**, Jane. *Post-modernism* – I hear that word thrown around all the time – **what's that got to do with the price of carbon?**

I take it that they **wouldn't mean it as a compliment?**

Most likely not!- In fact, that's the gist of a response that I got at the play-group the other day – in the course of one of those **kaleidoscope conversations** – as you call them – I chimed in **about the 97% of scientists thing** that we talked about earlier.

And what was the **pearl-of-wisdom** response – or should I say '**fragment-of-coloured-glass-opinion?**

It was something like *that sounds like an utterance from the discredited hegemonic pre-modernists who have dominated the public conversation.*

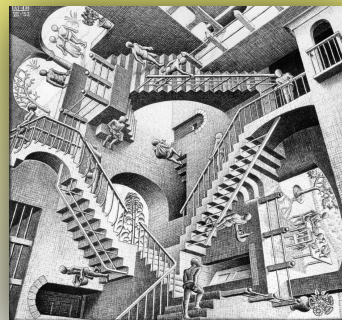
That kind of language in front of children?

Don't worry! These fragments only come out when the kids are otherwise engaged. **There's some pretty well-read parents there!**

Not with me, darling, but there's plenty of people who would claim that your way of looking at things **is not with-it anymore.**

It's not necessarily **what** you're doing, Bruce – it's more **the way** that you look at it.

Well, **it is reality** – and post-modernism involves the **belief** that many, if not all, **apparent realities are only social constructs**, as they are **subject to change** inherent to the particular time and place.



Probably the same stuff that you used to – but that's not the point.

If I don't **say something quickly** to tie this together, the **kids will be all over us** and that will be it for days.

Does that mean **I'm past-it or post-it**, whatever **it** might be?

Oh? And what do these *post-modernists* claim to be more *with-it* than what I'm on about? **I'm recognized as being at the cutting edge in my field.**

Go on – please. And what is **it**?

What are these people smoking, Jane?

We're at the **and the point being** point?

Press on, Jane!

Well, Bruce, the other night you outlined what a scientist was about. If I've got it right, **science is about a universally shared reality**, with the objects in the universe moving about **according to laws that are the same everywhere**.

Spot on, Jane!

Thanks, Bruce. Well, that's considered a **modernist viewpoint**.



Oh! I am the very model of a **modern major viewpoint!**

Maybe! Post-modernists are inherently **suspicious** of this **global cultural narrative** thing and prefer to think that reality is essentially a **local construct**. In summary '**appearance is reality**'.

Well – that goes a long way towards a **useful interpretation** of a few **prominent politicians** that I could name.

Steady, darling. **No names, no pack-drill!**

Okay, Jane – so as a consequence of this **quaint perspective**, they think that anyone who claims that *apples will fall towards the earth* at the same speed in Chile, China or Chiswick is **acquiescing to a global cultural hegemony** imposed through an insidious conspiracy of scientists and their political puppets?

Not quite, Bruce.

I doubt it, darling. They would suspect that you were a **neo-deconstructuralist opportunist** and you were simply offering **re-contextualization** to get their vote.

....But they might vote for you if you made **child-care tax-deductible**.

Their views on **practical matters** seem to be pretty **short-range**. Maybe there's a connection between the two.

*...But soft! What light through yonder window breaks? **It is the sun**....*

*And therefore have I slept in your report,
That you yourself, being extant, well might show
How far a **modern quill** doth come too short,
Speaking of worth, what worth in you **doth grow**.*

Would the po-mo's vote for me if I said that I would **repeal the universal law of gravitation** and allow for greater cognizance of local gravitational conditions?

Oh! Darn!

Are they post-modernists – or just **pragmatists**?

Ah! **Now I'm beginning to see the light.** Their interest in wider matters is *inversely proportional to the prevailing interest rates* – interest in interest! **Soft thinking for hard times!**

Yep- **daylight!** Would you like a **modern** cup of coffee lane?



Chapter 5

SCIENCE AND ANTI-SCIENCE

In which Jane describes last night's rather unpleasant dream to Bruce, who sees it as a metaphor for how scientists do their work.

Ant/Path- photograph
by the Author



Ugh! Weird! In my dream **I was an ant-hill**. Ants were streaming out of me in all directions, wandering around, **as if they were in a dream**. Then they would start coming back home to me- and the wandering became **faster and straighter** as they rushed towards me- carrying little bits of **Lego**, which they then assembled over me. It went on in waves- wandering out, rushing in, wandering out, rushing in ... **agghhh!**

Interesting!- that's your usual code for some **theory** or another that you've got. How about a bit of **my poor darling, you must be distressed by a dream like that?**

Far out! That's one giant step for ant-kind. Go on – **we can't leave it there.**

That problem never kept me awake at night – although you think that it has visited me in my dreams?

So- what was that **'ant dream'** last night, Jane. You seemed to have been quite disturbed by it.

Sounds a bit like the **labour of Sisyphus** of cleaning up the kids' playroom, Jane. But the **ants- now that's interesting...**

Well, my care and love for you **almost goes without saying**, Jane. My first thought was that you ate **too much dark chocolate** last night. But whatever the **cause** of your **lucid dream**, it's the dream itself that is most interesting. I wouldn't dare to try to **psycho-analyse your dream**, but on a literal level, it's 'interesting' because **it's rather like the way that science works with Ockham's**



Well, many people have looked at **ants** and wondered **how it is that the usually make straight trails from a food supply to the anthill...**

Very blokey! **Squashed-ant cologne!**

I've heard of that, Bruce – **even blokier.**

And how does the trail get to be shorter – they could just wander round **like Hansel and Gretel in the woods?**

So all those scientists are just wandering around, prodding and poking and guessing until somebody cries out **eureka!** – and then all the boffins fall into line?

No need to worry, because it's been figured out- the ants have their own little Ockham's Razor rule – ***follow the strongest scent.***

Well, actually it's a **pheromone.**

Not really, in this case, Jane – it seems that all the **worker-ants** are **sterile females**- no comments, please! Anyway – the ants leave a trail of a **particular pheromone that is short-lived**, so the scent fades quickly with time. **The strongest scent will be on the shortest trail.**

Mainly **trial and error**- the first trail home will be the same one the successful forager went out on – and after it has signaled to its fellow ants that there's food out there, they all follow the wandering trail. But **some of them wander off a bit**, and find that they are home first, so **others follow their scent-trail**, which is stronger than the initial scent trail. So it tends to get shorter and shorter as a simpler trail is developed. Presto! **Ockham's answer.**

Nice, Bruce. Thanks. Is that what is meant by *anti-scientific*?

Not quite, Jane – there's lots of forethought with most scientists – forming hypotheses and testing them – **consciously looking for a simpler explanation**. In the case of ants – I don't think that they are hypothesis-testing – **just reflexively following the strongest scent trail**.

Moan. *Phero-mone*.

*Let me not to the marriage of true minds
Admit impediments. Love is not love
Which alters when it alteration finds,
Or bends with the remover to remove:
O, no! it is an ever-fixed mark,
That looks on tempests and is never shaken;
It is the star to every wandering bark,
Whose worth's unknown, although his height be
taken. Love's not Time's fool, though rosy lips and
cheeks
Within his bending sickle's compass come;
Love alters not with his brief hours and weeks,
But bears it out even to the edge of doom.
If this be error and upon me proved,
I never writ, nor no man ever loved*



Chapter 6

SHADOW AND SUBSTANCE

In which Jane and Bruce find that their weekly candlelight dinner at the local cheap-and-cheerful leaves them with much to digest.

Plato's Cave-
16th Century Flemish
School



Our usuals, Bruce – *lemongrass beef, soy chicken with cashews, steamed vegetables and steamed rice for one.* And a bottle of red wine. **We're not very adventurous, are we?** Thursday evenings – dinner by candlelight at the Oriental...

Maybe that's what people want, Bruce. It fits with their **post-modern sensibilities.**

The medium is the message, Bruce. It's the environment – the **ambience**, not the **specific content**. It's like the jungle noises at dusk – **everything's a-twitter.**

You're stealing my lines, Bruce. Maybe it's just different strokes for different folks. **You prefer a single magpie at dawn...**



Having your usual, Jane?

Quality, service and value, Jane...and **quiet enough to have a conversation.** I wonder why so many restaurants and cafes **care so little about acoustics** – hard surfaces everywhere and thumping music. They certainly encourage sound grabs rather than conversation.

Here we go again! Sounds like a cop-out to me. Maybe it just covers up the fact that **they haven't anything to say.** Could you give an old-fashioned-modernist defence of that statement?

That was hardly modernist, but that's about it – jungle noises – **full of sound and fury and signifying nothing.**



Maybe – but **I'm also there at dusk** – like **Minerva's owl.**

Minerva's Owl? You're a **real hoot**, Bruce. So you actually want to fly around with the **po-mo crowd**?



...you don't know what you've got 'til it's gone...

That's a colorful metaphor – at least half of it is. I don't quite follow you, Bruce. **More information, please!**

So you want **more steamed veges and rice**, Bruce?

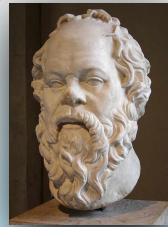
Then **sock it to me, Socrates**. What's on your mind?

You make it sound like a recent problem, Bruce. **Plato** railed against the **Sophists** way back when...

Hardly. The *Owl of Minerva* spreads its wings at dusk: **we only come to understand things in hindsight. That's the nature of explanation.**

Something like that, Jane. But seriously – *Joni Mitchell* and *Minerva's Owl* aside, **we're trying to explain climate change** in an intellectual climate that's like a mad aviary – **it's parrots versus magpies.**

Figure is that which always follows colour.



Yes, please – that too. But I was actually referring to **something Socrates said.**

Simply – *how does one present an extended explanation based on the song of black-and-white reason in a parrot-like echo chamber of colorful, but meaningless tweets?*

*That's the word I was searching for – **sophistry.** Cliches and rhetorical flim-flam!*

I think that you are a bit hard on the **oral cultures**, Bruce. Besides, it was Plato and his followers with their **universals** and **ideal forms** that the **post-modernists really object to**.

Just as well Plato didn't have a **Facebook page**, Jane – the po-mos would have **hacked it and crashed it**, for sure. Tell me, Jane, what was – or is – the **big angst between Plato and the po-mos?**

Well – he was a bit of a **totalitarian**

A ***bit*** of one?

Well, he – or Socrates – **proposed** a **city-state** in which there is **no private property**, women and children are held in common, **all is sacrificed to the common good** and the place is ruled by an unelected elite bunch called the **Philosopher Kings**.

Hmm. The first part sounds pretty grim, but the last part sounds like the **Czech Republic under Vaclev Havel** a few years ago. Maybe Plato was more of an **authoritarian** than a ***totalitarian***. In fact, as far as I can tell, he was **just an**

Rather more than ***just***. A lot of people took his 'ravings' pretty seriously in **Athens** at that time. They didn't seem to have the same views on the freedom of speech as we do – or Socrates did. **But I think that you're missing the main point, Bruce.**



intellectual who stood around copying down the ravings of another intellectual – *Socrates*. **Hmm.. more of a reporter than an intellectual.**

That **Plato and Socrates were obsessed with definitions and ideals and a perfect social order** that would be decided by just a few people. Socrates spoke out against tyranny, **but he hung around with tyrants** and seemed to want to cage people in his **own narrow set of ideas**.

...and the main point being?

It might be – if you don't agree with the basic premises. Maybe they had different views on what constitutes a *good society*. **Socrates didn't think much of democracy**. He thought that **with too much freedom, the people become drunk**, and tyranny takes over.

You finish it, Bruce. **I feel more *tired* than *tyrannical***.

Hmm... I can see that there is a difference... but...

...and **George Orwell**. Yes, I know, dear – there's lots of them. But don't you see the **connection between science and society?**

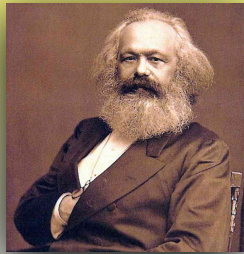
Perhaps Socrates thought that **genuine knowledge and professional competence** was more likely to yield correct policy **than a muddled majority opinion** – like Christopher Columbus and the flat-earthers legend. So you think that **trying to define things and use logic is tantamount to tyranny**, Jane?

I was just about to ask you **whether we should finish the bottle**. Do you want to risk *tyranny*.

But seriously, Jane, I think that there are **two ideas being conflated here** – their *ideas that underpin science and mathematics* and their *ideas about how society should be organized*.

...As you know, **my main interest has been on the first part** – *science and mathematics*, so my reading focused on the **Socrates-to-Plato-to-Aristotle** development of the foundations of science – **which is *real* stuff** – not on their *ideas about utopias* – or **dystopias**. All sorts of people have had a go at *the perfect society* – I read a few of them back in my undergraduate days – **Samuel Butler, Aldous Huxley** ...

Yep. From that ol' proto-modernist, **Karl Marx**: *the mode of production dictates the form each society will take.*



That's a big question to pose over *lychees*, Jane. It seems that you have some sort of answer in mind?

Wow! That's a great leap backwards!

Not at all. Just think of it. Our so-called **Western World** is characterized by its **almost slavish adherence to reason and logic and their off-spring – science.** They are not separate from our society – **they define it.** Think of it – and think of the alternatives – the *old* Orient, tribal and traditional cultures...

*To-morrow, and to-morrow, and to-morrow,
Creeps in this petty pace from day to day
To the last syllable of recorded time,
And all our yesterdays have lighted fools
The way to dusty death. Out, out, brief candle!
Life's but a walking shadow, a poor player
That struts and frets his hour upon
the stage
And then is heard no more: it is a
tale
Told by an idiot, full of sound and
fury,
Signifying nothing.*



Okay – I get it. But let's take a great leap forwards – do the Po-Mo's want us to make fire by rubbing sticks together – **or do they think that cave-warming will inevitably lead to global-warming?** They



can't have it both ways – **you've got to have fire before you can have Facebook.** And speaking of fires and caves – our little oriental tea-candle is flickering out – we've been here for hours. It must be time to relieve the baby-sitter. **Maybe we can continue this discussion tomorrow. Let's pay the bill and walk home!**

Chapter 7

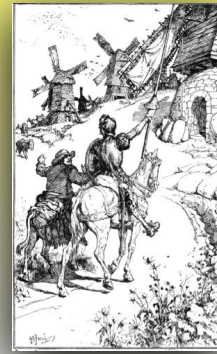
KEEPING UP APPEARANCES

In which Jane and Bruce take a trip to Bruce's Family farm. The conversation takes a surprising turn....

Luca Giordano (1632–1705): *Fresco, Palazzo Medici Riccardi in Florence, 1684–1686*



I'm impressed, Bruce. This *hybrid car* really is quiet and smooth. It makes **country driving** quite enjoyable. The kids have fallen asleep – as usual. At least they should be in a good mood when we reach your parents' place. I hereby name this car '**Rocinante**'!



Hibernating in a hybrid!
Ah! A bear in its natural habitat...! Ah! The Open Road!

That's quite a mix of road movies, really, Bruce. But it's really more like Monsignor Quixote here with you.

How so, Jane?

Like most of Graham Greene's novels, Monsignor Quixote was a dialog between faith and reason – often in the context of a **revolution**.

Oh? – who was *faithful* and who was *reasonable*?

Both of them!

Sounds **schizophrenic** to me!

Well, in that common sense of the word it was. Monsignor Quixote had reason to **doubt his faith**, and Sancho, the old communist ex-mayor, was **doubting his faith in reason**.

Your summary is like a small **sonnet**, Jane. These discussions are certainly testing both our certainties. **And the revolution?**

Both within and without, Bruce. And speaking of revolutions, Sancho-Bruce, isn't that a new wind farm on the hill over there on the left?

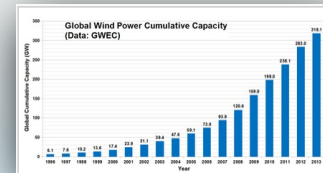
Personally, I think that those turbines look great out here – elegant – almost whimsical. What do you think of wind power, Bruce?

Both, actually. But first, there's been a lot of fuss recently about the possible adverse health effects of wind turbines. There's no point in exchanging coal for wind if all we're doing is exchanging one set of problems for another.

*The summer's flower is to the summer sweet,
Though to itself it only live and die,
But if that flower with base infection meet,
The basest weed outbraves his dignity:
For sweetest things turn sourest by their
deeds;
Lilies that fester, smell far worse than weeds*



Indeed, my dear Quixote-Jane. Although some people see them as ferocious giants.



Do you want me to comment on the aesthetics of wind power or its contribution to energy supplies and climate change?

Agreed, Jane. But as we've discussed, making dramatic assertions is easy these days – saying so doesn't make it so.

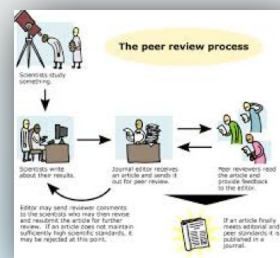
One of the playgroup parents said that he had heard an interview on the health effects of wind power – by – now who was it....?

Nina Pierpont. Yeah – practically everybody's heard of her by now, thanks to the power of the media. She claims that ultra-low frequency sounds from wind turbines affect human health. The big problem is that Pierpont's publication wasn't peer-reviewed – it was self-published and its so-called research was based on a very small sample of self-selected subjects with no control group for comparison.

Okay – so her research methods were a bit flakey – **but how do her findings stack up?**

There's a vast amount of verified **scientific literature** on the subject now. For example, the Australian NHMRC were concerned enough to release a public statement in 2010, essentially rebutting **Pierpont**. Unlike Pierpont, **they relied on peer-reviewed research from numerous sources**. The nub of it was that the **sound levels from wind turbines are actually quite low** – much less than a car a 100 metres away and **not much more than the background noises in the countryside at night**.

So much for Pierpont – **but what's the big deal about peer review?** Those words get thrown around all the time and often with a **sneer**.



Maybe – **but we can't sneer at peer review**. It's the best system that we can get, this side of heaven. Scholarly **peer review** – also known as **refereeing** – is the process of subjecting an author's scholarly work, research, or ideas to the scrutiny of **others who are experts in the same field**, before a paper describing this work is published in a journal.

Isn't Pierpont an expert? I understand that she is a doctor with Harvard qualifications – **that's pretty impressive**.

Indeed, **very impressive**. It will – and has – impressed lots of people. **The key words are experts in the same field** – Pierpont is a **pediatrician** and she is commenting on areas that are **well outside pediatrics** – not to mention **demonstrating the actual causes of those claimed symptoms**.

But that doesn't mean that the claims aren't true.

*That I have frequent been with unknown minds,
And given to time your own dear-purchased right;
That I have hoisted sail to all the winds
Which should transport me farthest from your sight.*



Certainly, they may well be true. But we come back to that vexing issue of truth. **What do we mean by *truth*?** When a bunch of people, whose state of mind and health is unknown and who **have a pre-conception** about an issue are then questioned by another person with a **pre-conceived agenda**, it raises lots of issues as to **whether the findings have any wider validity.**

That pretty well summarises it, Jane – ***Shakespeare on peer-review***. Another problem is the way that the **researcher can influence the findings by their interacting with the subject.**

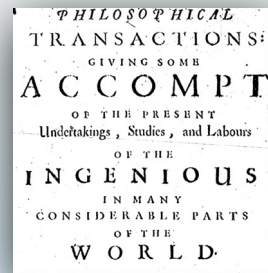
How so?

It's a bit like push-polling. The questions are loaded and are designed to lead the person being questioned in a certain direction of thinking. The classic question is ***have you stopped beating your wife?*** More recently, the technique has been called 'framing' made popular by cognitive linguist George Lakoff's famous ***don't think of an elephant.***

I see. It's rather like those John Grisham court scenes, where the judge strikes out a question on the basis that the **witness is being lead.**

Exactly. Which points to the problem of everyday experience with these matters: Most people have seen a courtroom drama or two. These scenes are made interesting by the eloquence of the *hero-cum-attorney* – sometimes for the defence, sometimes for the prosecution. Although we often **know** what the *just* outcome should be from earlier information in the movie, **it is the attorney's eloquence at advocating – *sophistry*, if you like – that sways the jury to see the evidence in a particular light.**

So what *is* the big difference, Bruce, **between a court-case jury** – which is, essentially, twelve *social* peers – **and a peer-review panel** for a so-called scientific publication?



Hmm... That comparison has been made before, Jane. **Francis Bacon** believed that **nature could be investigated by the same method as a lawsuit** and **Robert Boyle** spoke of arriving at **moral certainties** through the scientific method and the **Royal Society**, in the late seventeenth century insisted on **witnesses** to ensure that the *findings*, or **knowledge**, were – as **Ziman** later called it – **reliable**.

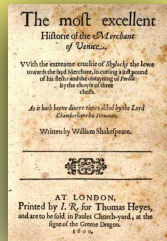
So the *scientific method* grew out of the *legal method*?



How so?

To some extent. But what passes for *evidence in law* is often different from *evidence in science*, although there seems to be an **increasing convergence** between the two, again.

Hmm... OK – **The Merchant of Venice** was a **contractual dispute** – Antonio owed Shylock money as a loan guarantee and couldn't pay it.



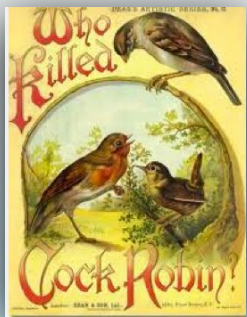
Well, first, we need to **separate out the parts** of what we call '**law**' and what we call '**science**' that bear some comparison. With *law*, we are essentially looking at situations where a judgment is to be made about an alleged transgression of the law – **or rules or guidelines to conduct that have been agreed to by society** – for example, **civil cases**, where there is a dispute over a contract, or **criminal cases** where someone has been harmed or property has been stolen.

Well done, Bruce! – I can appreciate *that* difference, now – **but what's the law/science connection?**

If I recall, Jane – that was the infamous '**pound of flesh but not a jot of blood**' story. But I think it crossed over to a potentially criminal case, **because any blood spilled would constitute a crime**.

Indeed – Shylock was entitled to flesh, **but no mention of blood was made in the contract**, so he definitely couldn't have any. I get that, Bruce. I thought that it was just clever – **but you see more to it?**

In the case of the *Merchant of Venice*, it seems that there was **no real dispute about whether there was a contract default**. However, it is an interesting case of what is called '**black letter law**' interpretation of commercial contracts, where, unless an item is **specifically included, it is deemed to be specifically excluded** – the list of items is very literal, objective and complete.



To me, it highlights the **central problem that besets both law and science** – the notion of **certainty** regarding salient information that bears on being able to make a statement about the **cause** of an event. **In the case of law, causality is only part of the issue** – after cause is established, **issues of justice, fairness and mercy take over**: the Sparrow may have killed **Cock Robin**, but **should he be punished?**

**The quality of mercy is not strain'd,
It droppeth as the gentle rain
from heaven
Upon the place beneath...**



Funny thing, Jane... the *Sparrow* 'fesses-up as soon as the question is asked, the *Fly* verifies the event and then the rest of **the critters are more concerned about their role in the funeral proceedings** – no issues of punishment, justice, fairness or mercy!

Perhaps it goes to show the virtues of an early confession, Bruce.
'Promise me life, and I'll confess the truth...'



Yes, Jane – I've noticed more than a few public figures using that stunt to deflect attention from their transgressions **by making a virtue of 'fessing up.**

So – science is more interested in *who* killed Cock Robin than the funeral proceedings?



...But we digress – although it does illustrate how easy it is to mask the core issues. **Our core issue** revolves around **this thing called ‘evidence’** that leads to ‘proving’ the transgression, or more neutrally, the event – **what was the causal chain?**

Confident is a pretty broad word – **what does *confident* look like, Bruce?**

Essentially – yes. For the most part **justice is about human values** and **science would like the information to which we apply our values to be as clear as possible** so we are as confident as possible, given that information.

Hmm... sounds like hair-splitting to me, Bruce – but press on – **what happens in science?**



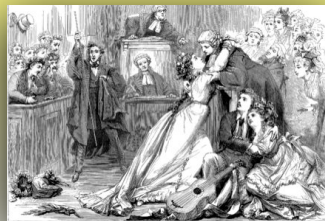
In law, *confidence* is expressed by several ‘**standards of proof**’ – for *civil* cases, the standard is usually **the *balance of probabilities*** and in *criminal* cases, it is about ‘**beyond a reasonable doubt**’, which is supposed to be a stronger, or more convincing proof, **as the penalties are usually larger.**

Not from the stars do I my judgement pluck...

Remember, Jane, that when we first started these conversations, I said that I usually assessed things on the basis of ‘**likelihood**’ – which really relates to ***probability*** – and in a way is similar to the *balance of probabilities* in civil law. In simple, but strict mathematical terms, ***likelihood* is about events that have happened and *probability* is about possible future events.**

I'm glad that we didn't split the hair crossways as well. Keep pressing on, Bruce.

Very theatrical! And in *science*?



That sounds pretty wishy-washy, Bruce!

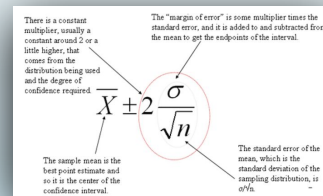
Whoa! My head's swimming with numbers, Bruce – we agreed that numbers aren't my forte – and certainly not while I'm driving!

...So, **legally**, we should talk about the *balance of likelihoods* rather than the *balance of probabilities* but for our purposes, we can use them interchangeably.

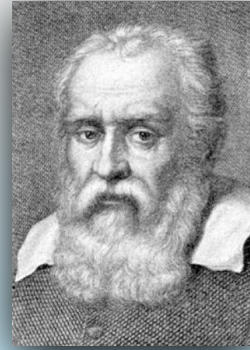
A very important **difference** is that **in law, we have to make a decision** – a decision that is going to be **unpleasant for someone** – and **that unpleasantness can't be entirely undone later**, even if we change our minds – that decision is a **commitment** – that's why we hear that someone has been *committed* – **the judge is bound to a course of action.**

Well, we certainly make many decisions *based on scientific findings* – including imposing *carbon taxes* – but in *science itself*, essentially, there is no **commitment.**

Not really, Jane – scientists will always say – or imply that they are saying – that the information or data that they have gathered – their evidence, if you like – **it is likely that A caused B.** They will then assign a probability to that statement – for example 'a 0.99 probability' or a '**confidence interval of 90%**' or '**a statistical significance of 0.95**'

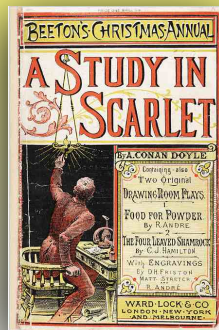


For example?



Okay – fair enough! But if I can make one more important point on this matter, Jane – perhaps *the most important point*: **When we scientists are trying to explain something we are trying to describe the *causal connections* between events.**

Now we're getting into my territory, Bruce – **this sounds like Sherlock Holmes – CSI stuff – forensic science!**



For example, event A has always been observed to *precede* event B... **But the point here is that scientists are *inherently non-committal* – you can make what you like of their findings or evidence – it's up to you – **you be the judge** – or jury. One judge might want a higher level of statistical significance than another to convict the accused person. **Scientists aren't *convicting anybody*** – although their statements might lead to someone being convicted.**

Well – essentially – yes – although, with the emphasis on drama, **CSI TV programs are probably closer to the original Roman use of the word *forensis*** – both the *person accused* of the crime and the *accuser* would give speeches based on their sides of the story. **The individual with the best argument and delivery would determine the outcome of the case.** The emphasis is on the sophistry – **it's the science part is where CSI is weak.**

Give 'em a break, Bruce – **it's TV drama, not a documentary!**

Maybe we'll come to that later, Bruce. I recall that you said previously that you had been an expert witness – **that was before we met**. I'd like to talk more about that, but before we drift too far, **how would you sum up the basic difference between law and science?**

You have to, Bruce! – One sentence – we're almost at *La Mancha* – I mean – your parents' place. **I don't want to be left hanging...**

*Betwixt mine eye and heart a league is took,
And each doth good turns now unto the other:
When that mine eye is famish'd for a look,
Or heart in love with sighs himself doth smother,
With my love's picture then my eye doth feast,
And to the painted banquet bids my heart...*



Do you think that it's possible to convert people's views about science, Bruce?

Yes, given all the hope before Copenhagen '09, it's quite unexpected.



Fair enough. But it's something I'm pretty sensitive about, having been an expert witness for quite a few court cases. A solid diet of this kind of fiction **tends to influence people's understanding and expectations.**

Hmm... **Summing up sounds a bit like a commitment** – not my forte. But, if I had to...

I wouldn't want you to hang for want of a sentence, Jane. To use *John Ziman's* words, it's **the difference between evidence and advocacy** – science doesn't *insist* on a judgment – law does.

I can always dream the impossible dream, Jane – but I know that it's an almost **quixotic quest**. But – hey! Who's doing all the converting these days? **It's like the Spanish Inquisition out there...**

But nobody expects....

Chapter 8

BUSH TURKEY

In which Bruce and Jane take a walk in the bush and discuss some of Bruce's formative experiences. Jane finds that there was more to Archimedes than smoke and mirrors.



The kids just love being here on the farm, **Bruce**. We're so lucky. Now that your Dad's got his new knees, he's happy to walk with them to the creek and look for tadpoles. While they're doing that, **we can walk up to the top of the hill through the bush and chat as we go.**

Let's do it, Jane! Growing up on a farm seemed like a bit of a disadvantage at the time, but the more that I reflect on it, the more **I think that I was the one with the advantages.**

How so, Bruce? No friends to play with after school – miles to ride to the school bus – in all kinds of weather – **heaps of chores before you could go off and do your own thing...**sounds like *disadvantage* to me. You did well to get a scholarship to finish high school in the city.

Yes – that's what I thought at the time, but on reflection – **I actually got to understand a lot of things** – like the *weather* and the *seasons* and **how things work**. The chores were a bit of a drag, but I made chopping wood into a game of skill – and carrying buckets of grain and water for the poultry kept me fit **and taught me that things don't just happen as if by magic.**

So you think that these visits to the farm are good for the kids?

If it weren't for our visits to the farm, **I'm sure that our kids wouldn't have a clue where an egg comes from or even that water only runs down-hill.**

Really?

I envied the town kids because I was alone a lot, but as a result **I had time to be with my own thoughts.** Sometimes I'd meet up with other kids on the weekend and we'd ride for miles – all very safe.

It's hard to imagine growing up without TV, Bruce. As a kid, **I used to revel in the costume dramas** and then play dress-ups with the other girls in the street. **We even built our own theatre and made up our own plays.** It was lots of fun – no wonder I carried on with it. **Perhaps I've never grown up.**

Gee... I just thought that Shirley Temple was cute...



From what I've seen, Bruce, I think that your Dad was – and is – quite proud of your achievements, just that he couldn't show it. **Typical bloke of his generation!**

All-in-all, I think that **it gave me a good understanding of the physical world**, its scope and its limitations. I tried to fit all the **practical stuff that I experienced into my own funny little theories.**

Part of us never grows up – or at least **I think that it shouldn't**, anyway. In fact, I think that it's unhelpful to look at imaginative play as *just kids' stuff*. I suspect that many people have inadequate imaginations because their parents prevailed on them to *grow up* too quickly and **they prized precocious behavior above normal juvenile behaviour** – the **Shirley Temple** syndrome – *adult behavior in kids*, I call it.



I rest my case, Jane. But, certainly, life wasn't all frivolous – **we had fun, but we had responsibilities** – Dad would often chide me for not doing my chores, and approval was pretty rare. I guess it was pretty hard for Dad trying to keep a farm going with a gammy leg **and a dreamy son. Kids remember the parental negatives more readily than the positives.**

*As a decrepit father takes delight
To see his active child do deeds of youth,
So I, made lame by Fortune's dearest spite,
Take all my comfort of thy worth and truth;
For whether beauty, birth, or wealth, or wit,
Or any of these all, or all, or more,
Entitled in thy parts, do crowned sit,
I make my love engrafted to this store:
So then I am not lame, poor, nor despised,
Whilst that this shadow doth such substance give
That I in thy abundance am sufficed,
And by a part of all thy glory live.
Look what is best, that best I wish in thee:
This wish I have; then ten times happy me.*



I Guess that's a pretty good summary of my youth, Jane. TV reception was pretty poor – right up until they had a satellite dish installed just a few years ago – **so I'd listen a lot to the ABC** – it was an amazing window into the world of reasoned discussion – **and good pronunciation of English.**

I thought that **diction** you got that from boarding

No – it would have been too late then. **I used to read all these big words in my encyclopedia** that people never used in conversation out here. I had my own ideas on pronunciation and **I'd feel a bit silly when I heard it pronounced correctly on the ABC.** I think that they have relaxed their standards in recent years.

'O tempora, o mores'... But Bruce, you think that **you took to science because of your experiences as a kid on the farm?**

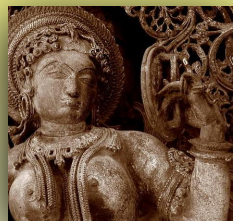
It's always impossible to unpack the motivations for any action, Jane, but I can say that when we started doing science at school, **it made a lot of sense to me because of the many little experiences that I had around the farm** – real experiences, not just reading about someone else's experiences. As well, I thought that the **rigorous methods of experimentation** that we used in the science classroom were very empowering.

I'd like you to tell me **some of these experiences in detail, Bruce...**

You've mentioned some of your experiences before – generally over dinner with friends, **where the conversation invariably segued to other topics and the point was lost.** I recall that you thought that a certain experience with **mirrors and turkeys** was very formative. We've got the time now – can you spell that out – I'll try to keep on track if you can.

So – **you were a little Archimedes in the making!** That explains a few things. But you weren't trying to burn your model boat in the dam?

Nice one, Bruce. So much for blowflies – I could have told you that – we were always taking Mum's mirror outside so that we could put on make-up for our plays – Mum's make-up, too. It got us into all kinds of trouble with her.



Oh – yes! ***The mirror and the turkey.*** Well – Other than sunburn, I was first exposed to the possibilities of **solar energy** when I was about ten years old.

One night, in my verandah bedroom, by the flickering light of a kerosene lamp, I strained to read about **Archimedes solar heat ray** incinerating the invading fleet at the siege of **Syracuse**. The illustration in my encyclopedia had Archimedes in a stately pose in Grecian garb, directing a single ground-mounted mirror at the **hapless ships**. At that



age I was unaware of **scientific disputes** and implicitly trusted my encyclopedia – it was all that I had, which was infinitely more than my handful of classmates at our local two-room primary school.

No – I tried to repeat Archimedes feat by **taking my mother's hand mirror** and directing at the blowflies that gathered in the cool shade of the verandah near my bedroom. But there was no **eureka! moment** – and, although the **reflected** bright oval of light clearly revealed the swarm of flies on the wall, **it failed to burn them.** And I found that when I shone the mirror onto my own face, it barely warmed it, **but it did illuminate my curiosity.**

*Even so my sun one early morn
did shine,
With all triumphant splendour
on my brow*

So where does the turkey come

What were you expecting
to do to the turkey with
the mirror?

Needless to say, you
didn't report your failed
experiment to your Dad?

Well – I figured that the problem was that the **hand-mirror was too small** and didn't collect enough energy. So when Dad and Mum had gone to town one Saturday morning and left me home to do some chores, **I decided to take the mirror off the top of the chest of drawers** in their bedroom and try that – **it was the best part of a metre square** – I could hardly lift it.



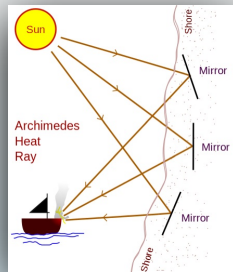
There wasn't any hypothesis – in fact when I took the mirror outside I thought that I'd shine it at the shed, or a tree or something like that. I was just starting to fool around with it and one of our free-range turkeys came strutting by – about five metres away. **Okay turkey! You're the invading Roman fleet! Sigh Rah Kews will be saved!** I think that I was hoping to set fire to its feathers – that didn't happen, but the turkey was in this intense rectangular spotlight for quite a while and as a result, was **pretty well blinded by the light**. It staggered off and in a bit of a panic I put the mirror back on the dresser and got on with my chores.

I didn't see it as a *failure* – **I had succeeded in doing something** – namely, **temporarily blinding a turkey**.

So this became your first scientific publication?

Poor turkey! But why didn't the turkey catch fire? That was a *big* mirror?

Unfortunately, no! When Dad got home he saw the dazed turkey staggering around the yard and asked me whether I knew anything about it – had the dogs mauled it, or something? **I disclaimed any knowledge** – *what turkey, Dad?* Years later I fessed-up – Dad laughed and said that he had suspected as much, **but didn't want to discourage me**. Of course, at the time I thought that parents essentially disapproved of everything that kids did – **but that's kids**.



Good question. In summary, like most people, as a ten-year-old, **I didn't know the difference between temperature and energy**. The big mirror **reflected** lots of energy, but it didn't **concentrate** it to increase the temperature. It's the same misconception that many people have these days about solar energy. **The mirror would have to be curved to do that** – or a lot of them like a **solar power-tower**. Archimedes would have had the same problem. But that wasn't the only experiment that I did with turkeys.

I can hear the groans from **animal rights activists** already!

Anything else that you'd like to 'fess up to, Bruce?

For sure – but this all happened **long ago when a lot of gruesome things were considered fairly normal**.

Anything else that you'd like to 'fess up to, Bruce?

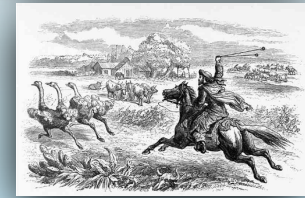
So the turkey was a stand-in for cattle on the Pampas?



Oh no!

So you were a 'turkey-denier', Bruce? The bolas sounds similar to the way we did spins in ice skating classes – the closer our arms got to our body, the faster we would spin – and sometimes finish up on the ice tangled like your turkey. All very funny – **but what was the point of these stories?**

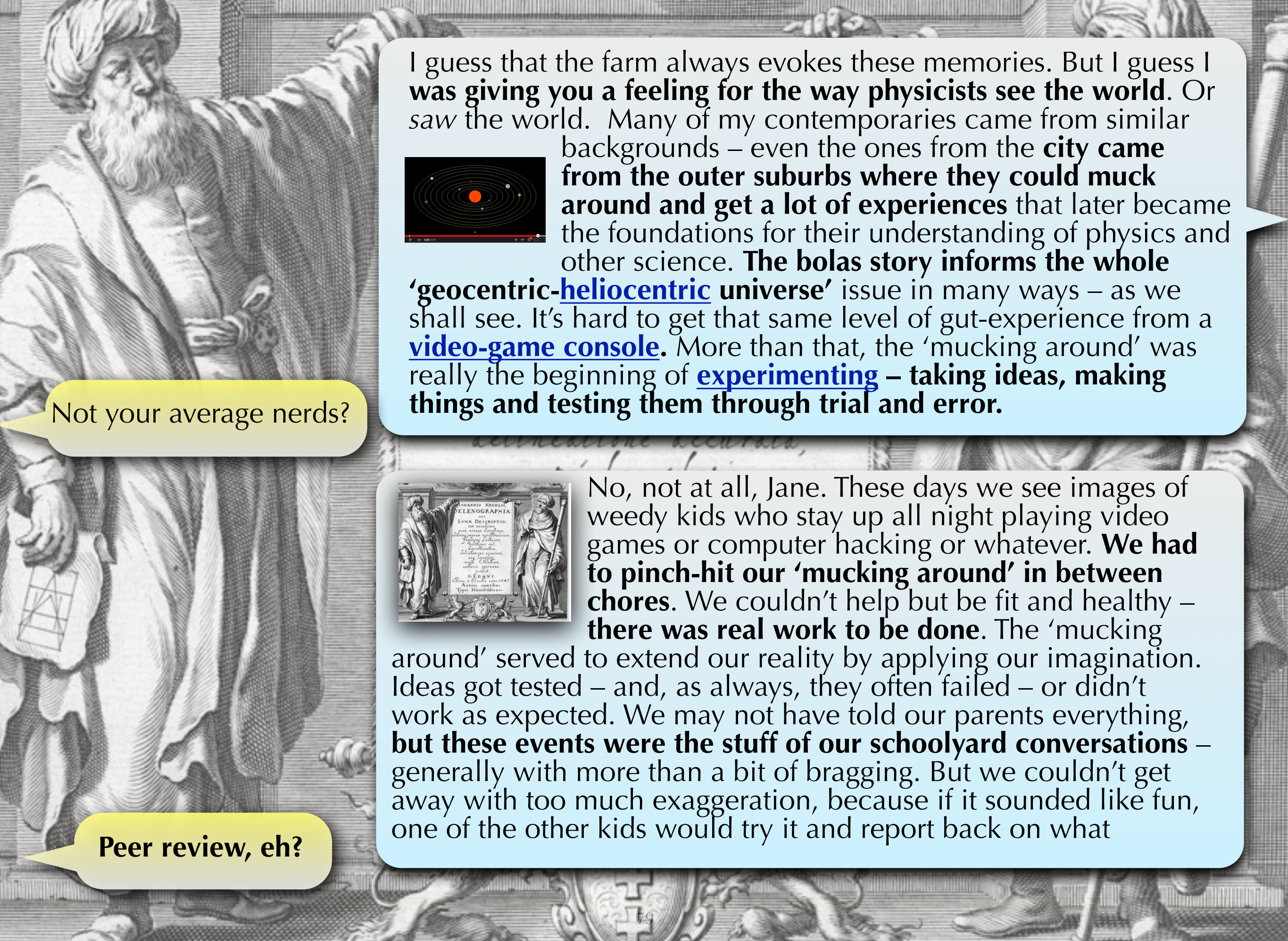
Hmm... well, my encyclopedia also has a great story about how the South American gauchos, or cowboys, **used a thing called a bolas** instead of a lasso to capture cattle. It looked like fun, so **I made one using three bootlaces and three one-inch nuts** from the workshop.



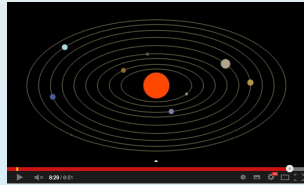
Kind of. I first tried it on a fence post. I'd swing it 'round and 'round my head – and then let go. **The laces would make a terrifying whiffling sound going through the air** and when one of them caught on the fence post the **other two would quickly whip around the post tighter and tighter**.

Oh yes! But I aimed at the turkey's legs, not its tempting long neck. **Whirl! Whiffle! Whip!** And over went the turkey, with its legs in a mess of bootlaces and one-inch nuts from the tractor-shed. **It was such a tangle that I had to cut it off with my trusty pocket-knife.** Darn! That was the end of my bolas! The turkey staggered to its feet and wobbled away. **More questions from Dad and more denials that night.**

Point? Lot's of points.....



I guess that the farm always evokes these memories. But I guess I **was giving you a feeling for the way physicists see the world.** Or saw the world. Many of my contemporaries came from similar backgrounds – even the ones from the **city came from the outer suburbs where they could muck around and get a lot of experiences** that later became the foundations for their understanding of physics and other science. **The bolas story informs the whole ‘geocentric-heliocentric universe’** issue in many ways – as we shall see. It’s hard to get that same level of gut-experience from a **video-game console.** More than that, the ‘mucking around’ was really the beginning of **experimenting** – **taking ideas, making things and testing them through trial and error.**



Not your average nerds?



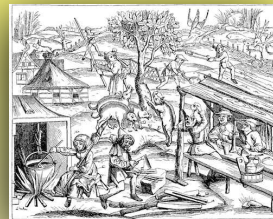
No, not at all, Jane. These days we see images of weedy kids who stay up all night playing video games or computer hacking or whatever. **We had to pinch-hit our ‘mucking around’ in between chores.** We couldn’t help but be fit and healthy – **there was real work to be done.** The ‘mucking around’ served to extend our reality by applying our imagination. Ideas got tested – and, as always, they often failed – or didn’t work as expected. We may not have told our parents everything, **but these events were the stuff of our schoolyard conversations** – generally with more than a bit of bragging. But we couldn’t get away with too much exaggeration, because if it sounded like fun, one of the other kids would try it and report back on what

Peer review, eh?

Boys?

Hmm... that helps explain something!

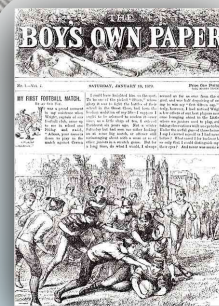
That's right – we started talking about climate change and **segued off into Archimedes, mirrors, turkeys and gender-imbalance in peer review.** Our stroll up the hill and back seems to have disappeared in a flash. **Any last comments before we get back to the house?**



There seems to be a few leaps in there, as well as flashes, Bruce.

Sure was. Respect came from having the most amazing stories that were **verified by the other boys.**

Absolutely. As pre-teenagers, girls were another race and this kind of behavior served to make an exclusive bond between the boys. **That's just the way it was.**



Yeah – sorry about that. But I think that the girls came into their own in high school chemistry, with *their* background in helping Mum with the cooking. **But, both boys and girls alike spent a lot of time in a wide variety of practical experiences,** which eventually make for that 'country wisdom'. It's interesting that more farmers believe in climate change [than their city counterparts.](#)

Talking about *flashes* reminds me of another Archimedes connection – the *eureka moment* – **that flash of inspiration in the bath and its connection to forensic science** that we were talking about in the car as we drove here.



Well, it's like this: It all came about – the ***eureka*** thing – because **King Hiero of Syracuse** suspected that the goldsmith was diluting the gold for his new crown with silver. **According to legend, Archimedes figured it out by noticing how the level of water rose in his bath.** It's actually a lot more complicated than that, but our point is that it was an early case of the use of science in law. **History doesn't record what happened to the offending goldsmith.**

Was that story in your encyclopedia, too, Bruce?

And did the boys do peer-reviewed experiments to confirm it?

Speaking of which, it looks as though the kids had a good time in the creek with Grandad – **they're covered in mud!**

It sure was.

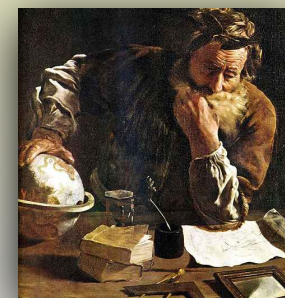
Well actually, **it was a gender-balanced experiment.** Water was always in short supply, so my sister and I shared the bath on Saturday nights. It was good, because with only one of us in the bath, there was hardly enough water to cover our legs. **When the second person got in the bath, the water level rose up to our waists.** We used to shout eureka when we found the soap.

*Thy glass will show thee how thy beauties wear,
Thy dial how thy precious minutes waste;
The vacant leaves thy mind's imprint will bear,
And of this book, this learning mayst thou taste.*

*The wrinkles which thy glass will truly show
Of mouthed graves will give thee memory;
Thou by thy dial's shady stealth mayst know
Time's thievish progress to eternity.*

*Look what thy memory cannot contain,
Commit to these waste blanks, and thou shalt find
Those children nursed, delivered from thy brain,
To take a new acquaintance of thy mind.*

*These offices, so oft as thou wilt look,
Shall profit thee and much enrich thy book.*



Chapter 9

NIGHT ERRANT

In which Jane and Bruce head home from the farm and Jane confronts Bruce about his apparent delay in discussing climate change.

Thirteenth Century Arabic text of *One Thousand and One Nights*

فقلت لها ظل الازرا كطيب
شاكتم نفس عن هجير وطل
انشدت من العاصي ابوبكر بن داود قال
اخلق الدهر جدتي بياتي و
كان لي لذة ينيل مراد ي صا
وانشدت ربا ايضا العاصي قال انشدت
لفقت انشدت بو جدتي قصرت
وادبني الزمان فما ابالي هجر
فليست بقابل ما دمت ح
انشدت ربا ابو محمد الكنتز بن عيا الكاف
انشدت من دعي بن سهل الضربة العلم
فانخل بما شئت من امير
انشدت ربا ابو محمد الكنتز بن عيا انشدت
لعدت معبرا زاهدا
واعجب من طغي نيا البقاو
سها المايا نصيب العبا
حده ابو محمد الكنتز بن عيا
البحق من ربي اذا ما خلوت الدر
وكل امرئ قد عاش مستن

رعا الى البدعة حده ابو يعقوب
من بعض الحكماء ان قال انتموا معاداه التعجيل
قال بعض الحكماء ان الجسد ايضا والله عز وجل
يقول من علامات الجسد ان يعلق الرجل اذا
شد المصيبة اذا انزلت وقال في الحيز
الذي ينسب الى الحاشد دوام نعمته
لدا ما ربا بدر ابوبن اهراب بن الجوالي قال
ابا الامتدب صاحب الكنتز بعباد ان يقول
نذر اصحابك اكل الشهوات فان العلوب
محبوبه حده ان سيف بن الحر بن
بن تمم قال كان سيف بن الثوري يمثل هذه الايات
فوقه اذ كثر المنية والعلوب الهول
به شيتت باكثره من نقيع المختل
كايح مثل وقع الجسد
انشدت ربا بن يوسف انشدت ربا بن عيا انشدت قال
بنا طلع فان اذا كضرت منك بالدين
رايشه فانما هي من الكان والنون
من العرب
تكره به حميد اذا تابت اليك صيوف

That was a great weekend away from the city, Bruce. **Your folks are amazing.** The kids revelled in the slime and mud of the creek and had a lot of fun in the kitchen with your mother. **She's as inventive as a cook as your dad is around the farm.**

They'll probably go in the deep freeze so we can use them *as and when*. **I don't know what our food miles and carbon footprint – or whatever you call it Bruce – is going to look like**, but those organic veges really are delicious.

We could discuss them now, Bruce? We're still a couple of hours away from home.

Bruce – **are you trying to *Scheherezade* me?**

Yep – necessity is certainly the mother of invention. Mum's garden is always a sight to behold. **And with chronic water shortages**, Dad invented – or probably *re-invented* – that clever reticulation system. It also made it easier for Mum to manage that large area. **By the way – what's your plans for that boot-load of veges?**

Hmm...*food miles* and *carbon footprints* – that's something we'll have to discuss at some stage. **In my opinion, there's a lot of myths and misconceptions surrounding those two notions.**

Nope. **We're not quite ready for that, yet**, Jane.

Now that's a verb I haven't heard before. I guess you can turn proper nouns into verbs – Simon and Garfunkel made a whole song of them:

فانت لها ظل الارزاق طيب ومن نعمت الارزاق ليس تخيف
شاكريم نفس عن هجره وطمه ومن تو لم هذا الطريق مخوف

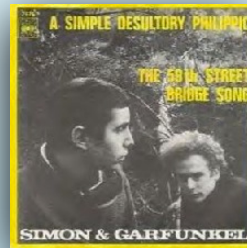
Oh! That's where we were...
and that segue neatly
illustrated the point.

Do you know the story
behind Rimsky-
Korsakov's symphony,
Bruce?



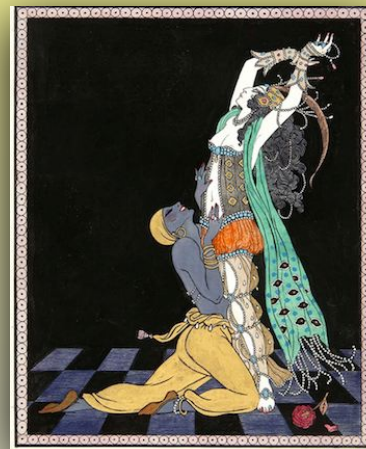
*I been Norman Mailered, Maxwell Taylored.
I been John O'Hara'd, McNamara'd.
I been Rolling Stoned and Beatled till I'm blind.
I been Ayn Randed, nearly branded
Communist, 'cause I'm left-handed.*

That's the hand I use, well, never mind



That was one of Dad's favourite vinyls – I
used to play it a lot myself – I thought it
was very funny. But back to the point
about *Scheherazade*...where's Rimsky –
Korsakov fit into the picture?

Well, it comes from the *Thousand and One Arabian
Nights* stories by Sir Richard Burton – well, translated
by him anyway. As the story goes, *King Shahrya*, who
had a grudge against women, would marry a
new virgin every day and would send
yesterday's wife to be beheaded. **He had
killed one thousand such women** by the
time he was introduced to Scheherazade,
the vizier's daughter. To avoid the same fate
as the previous thousand wives, **she would
start to tell him a story each night, but
would not conclude it until the next night,**
when she would start another story. She did
this for *one thousand nights*, after which he decided
that **he was in love with her and made her his queen.**

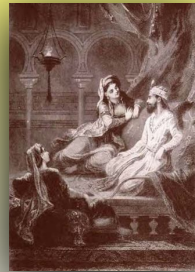


Not really – over to
you – **that's more
your thing, Jane.**

Hmm... **some grudge!** *He*
certainly knew how to set
up an incentive program.
**So you think that I am
stringing out this climate
change story to avoid
some unsatisfactory
conclusion?**

Let me try, Jane. So Scheherazade told a thousand and one stories before the king decided that he loved her? From my perspective, that's a pretty impressive data set. Unless the stories were pretty poor, I would have thought that he would have inferred something about the worthiness of Scheherazade before then.

Fair point. I think that he had some data other than the stories – by *that time* they had had three children together.



Bruce! It's only a story!

Anyway, I guess that they worked on the principle that **they grew to love the person they married**, not vice versa. In that case, **love would be more of a process than an event** – they didn't *fall in love* – they *grew in love*. Maybe I'll grow to love **climate change**, even if I don't fall for any particular explanation.

*But do thy worst to steal thyself away,
For term of life thou art assured mine;
And life no longer than thy love will
stay,
For it depends upon that love of thine*



Is that possible in one thousand days? Let's see – human gestation period is about nine months – say 270 days – times three – that's...

Possibly the thousand-and-second story that wasn't told!

That's a possible outcome, Jane – it's not as philosophically pleasing to me as empirically-backed reasoning, but it might be the best that we can do. A kind of coevolution of understandings. As we talk, I'm getting to know more about your point of view and hopefully, you of mine.

In our case, **let's hope for *co-evolution***. There's another possible interpretation of the *Scheherazade-King Shahrya* love story – **co-dependency**

We might need to work this out together – I really only know about the co-dependency part.

Hmm... **co-dependency** doesn't seem to be as symmetrical as co-evolution. **The co-dep person usually compromises their own values and integrity to avoid rejection or the other party's anger.** *Co-deps* are extremely loyal and often remain in harmful situations too long.

Hmm... **I'm not sure how we drifted out to here in this conversation, Bruce...**

What's the difference, Mrs Freud?

Well, ***co-evolution*** can be thought of as **the change of a biological object – a living thing – triggered by the change of a related object** – usually another living thing. The classical example of coevolution is the colour and shape and nectar quality of some flowers that match the visual perception, beak shape and dietary requirements of some birds. **Over time they have become increasingly closely matched so that the flowers can only be pollinated by the birds, and the birds are totally reliant on the flowers.** They evolve together, live together, and possibly die if they are apart. So what's *co-dependency*?



It doesn't sound like as much fun as *co-evolution*, Jane. I appreciate that, unlike co-evolution, we are talking about the establishment of a situation in one generation, rather than slowly over many generations, but I see that **the important principle is mutual dependency in an ongoing relationship.** For all we know, the passive flower might think that the hummingbird is the *aggressor* and *it* is the *victim*.

...but when one party to the relationship is a medieval king and has a track record of murdering 1000 wives and the other is a young woman, **it's hardly a symmetrical, or balanced, situation.** Scheherazade was dicing with death. **What I find curious is how you can look so dispassionately on such a situation!**

I think that I'm having an **aha! moment**, Bruce. I've just realized the **big difference between the so-called *scientific mind* and the so-called *artistic mind*.**

Glad to, darling. It goes back to Socrates and Plato and Aristotle and Archimedes and Galileo and.... **well... the whole bloody lot of you!** **You suck the humanity out of every situation that you look at!** **Everything is reduced to abstract principles and numbers.** What do you think of when I say:

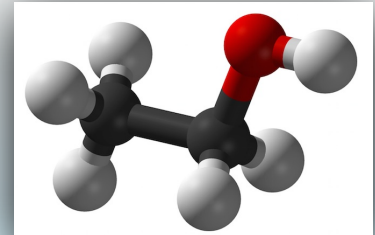
O thou invisible spirit of wine, if thou hast no name to be known by, let us call thee devil!

I rest my case!

I wish I had heard that quote the other morning **after drinking shiraz with Dad** – I had a devilish hangover. But seriously, Jane, **scientists aren't a bunch of bloodless zombies.** It's just that scientists are trained in the spirit of **Socrates** and **Francis Bacon** to **extract the essential features of a situation that they see that are common to similar situations.**

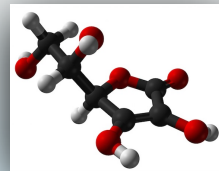
Well, I was only abstracting it to its bare essentials, Jane. To me, the configuration of the ongoing relationship was the most important element.

That's great, Jane. Such events are rare for all of us. **Do you care to share?**



Ethyl alcohol?

Extracting the essence – that's it! A bowl of oranges is reduced to a thousand milligrams of vitamin C!



But, Jane, what was Shakespeare doing if not portraying universal verities? He used poetry and metaphors – we scientists use equations and numbers. To a scientist, there is as much beauty in those equations as you see in a sonnet.

I guess that I'll never have that direct experience, Bruce. But it still doesn't make King Shahrya a nice man.

You didn't ask me whether I thought that he was a nice man. Clearly, he had behaved very badly, but I was commenting on his behavior towards Scheherazade. She started off thinking that he was *not* a nice man, but seemed to have changed her mind as time went on.

Hmm.... that's true...

So after all this ducking and diving in and out of reality, do you come to the conclusion that King Shahrya was a psychopath who led Scheherazade into a co-dependent



That's *appears* to be paradoxical, but, I understand, is not uncommon- **it's the Stockholm Syndrome**. Scientists are attracted to puzzles and apparent paradoxes in nature and life. **We try to subdue our immediate reactions of horror or disgust and try to look at the enduring patterns.** Having immersed ourselves in these abstractions and processed them, **we try to bring ourselves back to the world of everyday – or shared – senses to make statements about these enduring patterns.** This can't be done unless we can subdue our passions while we are immersed – otherwise our statements **will just be subjective and unreliable.**

So what can you deduce from all of this, Bruce?



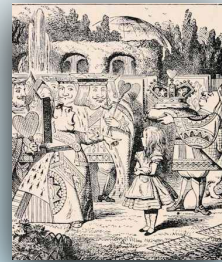
Err – well – most of them – [Lear](#), [Hamlet](#), [Othello](#). But they didn't murder one thousand women.

Really, Bruce!

I thought that I meant that you were stringing me along to avoid getting to the point. Maybe there's more to it than that. Well – are you? Is there?

Well, given that the story says that he came to *love* Scheherazade, **he couldn't have been a psychopath – they aren't supposed to emote like that.** We haven't really got enough evidence to psycho-analyse him to the point of making a medical opinion.

All I can infer is that over time **they formed a strong mutual attachment** – the situation *evolved* – hence **co-evolution**. To me, the word *co-dependency* is emotionally laden and forces us to pre-judge the situation – like the [Queen of Hearts](#) in *Alice in Wonderland*. It doesn't allow for other possibilities – including *a fair trial, forgiveness or redemption*. Say – Shakespeare's plays are full of murder and mayhem – **aren't any of these murderers and mayhem-ers redeemed?**



Is there a cut-off point? Ten? Twenty?

So when you asked me whether I was trying to *Scheherazade* you, **what did you mean?**

There usually is. **Do you love me more or less for these discussions we are having?**

*Where art thou Muse that thou forget'st so long,
To speak of that which gives thee all thy might?
Spend'st thou thy fury on some worthless song,
Darkening thy power to lend base subjects light?
Return forgetful Muse, and straight redeem,
In gentle numbers time so idly spent;
Sing to the ear that doth thy lays esteem
And gives thy pen both skill and argument.
Rise, resty Muse, my love's sweet face survey,
If Time have any wrinkle graven there;
If any, be a satire to decay,
And make Time's spoils despised every where.
Give my love fame faster than Time wastes life,
So thou prevent'st his scythe and crooked knife.*



We're getting there, Jane – **Only nine hundred and ninety four nights to go!**

Chapter 10

MUCH ADO ABOUT NO- THING

In which Jane and Bruce start to explore the stages of explanation. They find that East and West come together with a meeting of emptied minds.

*Statue of the
Buddha, Nepal.*

**Photograph by the
Author**



It's fascinating to watch the kids at play, Bruce. They're like little puppies – frolicking and yelling – ***totally involved in the moment***. They're divine! They're a long way from discussions on climate change.

Not as far as one might think, Jane. I agree with you – they're beautiful to watch – it's as though we are looking at something that we have lost.

Yes – some people call it **innocence** – that stage *before* we start to reflect on our inner and outer world. That's what the Bible is all about, as far as I can tell – the **Adam and Eve** story and their ***fall from grace*** – eating from **the tree of knowledge** – eviction from Eden and so on. *Lest ye become as little children, ye shall not enter into the **kingdom of heaven***'. To me going to heaven is about regaining that child-like state of looking at the world without reflection or judgment.



That's a very **secular** perspective, Jane – a long way from your convent days. It's very similar to the **Buddhist** view...

....from your commune days? What's the connection?



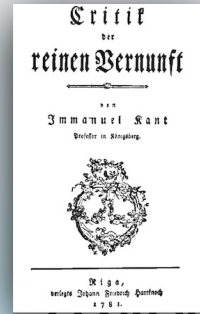
Well, it started then, I guess. In summary, **Buddhists see enlightenment as the transcendence of suffering** – and suffering is essentially all those mental states that come from anxiety, fear, reflection and desire. **You transcend by becoming child-like again – but not childish**. Or like a dog that *hasn't* been mistreated.

That's odd, Bruce – I thought that **enlightenment** was what we got from our western education – you know – '**the age of enlightenment**' and '**age of reason**' stuff, that started soon after Shakespeare's time.



Yes, I guess it does sound a bit contradictory, Jane –

Or perhaps they **Kant**. So what's the connection, Bruce?



Yes, I guess it does sound a bit contradictory, Jane – but as far as I can tell, the **Enlightenists were just taking the long way home**, so to speak. They saw that the church was decadent and reason was a pretty useful tool. Perhaps they could get to heaven by the '**critique of pure reason**', or maybe *practical reason*.

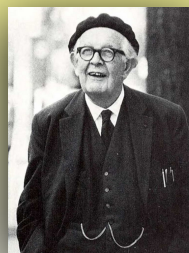
...and whose recollections were you recollecting when you wrote this?

Good one, Jane. Well, I've struggled with this idea of learning and understanding – particularly in science – for a long time. I even presented a paper on the topic at a seminar one of the unis a few years ago. I took the approach that understanding was a *cognitive-developmental* notion – an idea that goes way back to Socrates: '**....for all enquiry and all learning is but recollection.**'

The **lateral thinking** guy?

I got some ideas from **Piaget's** developmental psychology and from the inimitable **Edward de Bono**.

We did a bit of *Piaget* for teacher-training. He seems to have been somewhat superseded.



Yes – he used to be very popular – but my real interest wasn't in his lateral thinking thing, but in **the linear thinking thing that he was trying to overcome**. It seemed to me that we hadn't really sorted out what was linear thinking. This is where *Piaget* came in.

Maybe in detail, but the **essence of his work hasn't**.

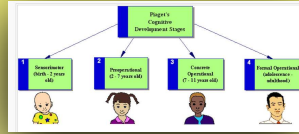
There's that e-word again, Bruce!

But I think I know what you mean. **Piaget**, as I recall,

proposed that there were four stages of cognitive development – starting

from birth with children being *purely practical and physical and in-the-moment* with their five senses, then the *development of motor skills*, then to *concrete thinking* and finally the ability to *think in a detached, abstract way*.

Gee! – that sounds like a slow **fall from grace** when you say it like that!



And after lunch, did you take on **Einstein**? Why didn't you try **Shakespeare** as well?

Probably everything he said was about *cognitive development*, but in particular, I was thinking of ***As You Like It***, when Jacques said:

*'All the world's a stage,
And all the men and women merely players,
They have their exits and entrances,
And one man in his time plays many parts,
His acts being seven ages...*



Totally agree, Jane! Well, I figured that there were a couple of things missing from **Piaget** – when it came to understanding science – although **he first trained as a research scientist**. First, he was dealing with *children's development*, so it left open the question as to ***how to explain science to a non-scientist-adult*** – who is supposed to be at Piaget's *abstract reasoning* stage, **but clearly hasn't acquired the abstract where-with-all of science** – you know – the *diagrams, the graphs, the equations and the like*. And secondly, **he didn't have enough stages to cover the idea of explanation completely or comprehensively**.

There's that 'S'-word again!

What, pray thee, did Shakespeare have to say about stages of *cognitive development*?

Ohhh!

...these acts – **seven ages** – begin with **the infant – mewling and puking in the nurse's arms** and work through six further vivid verbal sketches, culminating in **second childishness and mere oblivion – sans teeth, sans eyes, sans taste, sans everything**. Would that have helped?



They probably did, Jane. **Those seven ages – or stages of Shakespeare's – are part of our cultural DNA** – they help us think progressively. I think that they will come in handy later when we talk about life-cycle energy costs. But in this particular case of looking at *explanation*, **I was trying to focus on what happens when you have a fairly sane, sensible person – usually an adult, who says please explain that to me**, rather than someone at the *mewling, puking and oblivion* stages.

Okay – so Piaget's four stages and Shakespeare's seven stages didn't fit – **what did you come up with?**

Eight.

Why eight?

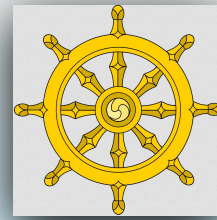
It's a very nice number.

That's an unusually feeble reason, Bruce. I'm sure that there is more to it than just being *nice*.

Well, in fact there is. When I started analyzing the way that science textbooks and lecturers explained things, **I came up with six distinct stages ranging from pictorial to abstract**. I then realized that there was a *seventh* stage that was a bit like Piaget's earliest *concrete* stage, but it seemed incomplete, because it didn't account for the way *geniuses* look at the world. **So I made an eighth stage.**

So why is that nice?

You've got me hooked, Bruce. You look like you're bursting to tell me more. **Lead on!**



That seemed *nice* because it was a kind of **eight-fold path**, like the **Buddhist path to enlightenment**. Besides, Buddhism gave me some other insights into Piaget.



Hmmm... *that's a challenge*. I'll try to give a **useable summary** and if you're still interested, I'll see if I can dig out my original paper. The first thing to appreciate is that **science, by definition, is empirical**. That is, **all explanations, no matter how abstruse, must be amenable to being referred back to our five senses**. This, in my view, is what Socrates was on about with his **learning is but recollection**.

Sounds sensible!

*Come on, then; I will swear to study so,
To know the thing I am forbid to know:
As thus, to study where I well may dine,
When I to feast expressly am forbid;
Or study where to meet some mistress fine,
When mistresses from common sense are hid;
Or, having sworn too hard a keeping oath,
Study to break it and not break my troth.
If study's gain be thus and this be so,
Study knows that which yet it doth not know:
Swear me to this, and I will ne'er say no."*



He seemed to think that we were born with the basic knowledge – **I agree that most of us are born with our five senses**, but it is *mainly our early experiences with our senses that give us the foundation for understanding*. As Einstein said:
Common sense is the collection of prejudices acquired by age eighteen.

Shakespeare seems to be a bit of a paradox to me, Jane.

How so?

His writing is so profound, but most of his characters behave like fools. They do all sorts of silly things and act impulsively. How can we learn from fools?

I kind of agree with you, Bruce – there's the *foolish* – and then there's the *fools*.

That sounds very Shakespearean, Jane. What do you mean?

Well, the *Bard* describes a lot of foolish behavior through his characters – most of whom are serious, upper – class citizens, whose *sense of reason is blinded by the extreme circumstances in which they find themselves*. As we all do, they fall back on their base emotions – jealousy, rage, grief, besotted love and so on – and then do foolish things – often murder.



But you make an odd distinction, Jane – aren't people who behave foolishly, fools?

Not in Shakespeare, Bruce. The fool is a special character – as well as providing comic relief after the serious characters had done something foolish, they were permitted to speak frankly, while others minced their words.



So they're like scientists?

There's more than a passing resemblance, Bruce.

So the fools are there to make sense of the foolish things that sensible people said?

Well said, Bruce! **There was an inner-sense to their innocence.**

Well, as I said, Bruce, the fools were *frank*- **they told it the way they saw it without gilding the lily.**

*Therefore, to be possess'd with double pomp,
To guard a title that was rich before,
To gild refined gold, to paint the lily,
To throw a perfume on the violet,
To smooth the ice, or add another hue
Unto the rainbow, or with taper-light
To seek the beauteous eye of heaven to garnish,
Is wasteful and ridiculous excess*



Maybe the *sensual* is the way that some of us make sense of our senses, Bruce. **We feel our way to the truth.** We use our *common-senses*.

I think that *Albert* had good reason for rooting for reason – given where he came from. He had a wider understanding of prejudice as well.

So why didn't Shakespeare say it straight out in the first place? Seems sensible.

Uh?



Okay! That's gilding the lily – squared! **It's a long way from Ockham's ants.**

But, Jane, although we have these five senses in common, **their common use doesn't always lead to a common sense of what is so.** I think that Einstein was referring to intuition, or tacit understanding when he is claimed to have said *prejudice* – a sense that is **rooted in our emotions rather than our reason.**

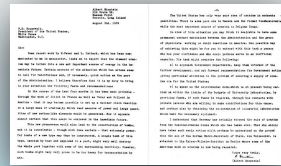
Albert Einstein
Old Grove Rd.
Nassau Point
Peconic, Long Island

August 2nd, 1939

The United States has only very poor ores of uranium

I hear that giant sucking sound of humanity going south – again!

Indeed, Jane but we'll leave that aside for the moment.....



Really, Jane! If we get lathered up every time we come across a reference to a tyrant, we, too, will surely become their victims.

Okay. We'll save that for later. Now I'm the one digressing. Please go on.

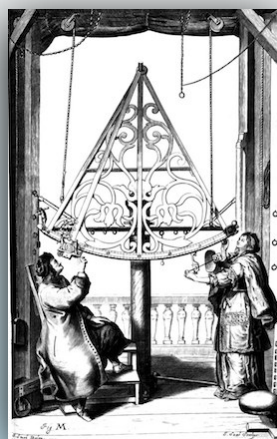
So we start with the notion of *feelings grounded in experience* and we also notice that we can talk about these experiences in *general terms* separately from the *experience itself*. That's what we can call abstract'. But these *general terms* can bear more – or less – resemblance to reality – ranging from physical or verbal pictures and diagrams through to *graphs* and *equations*.

I get the gist of it – but I hope that I don't have to learn equations to understand *climate science*.

It all depends on what will satisfy you in terms of 'understanding', Jane. If we take *understanding* to mean that we feel *knowledgeable* about the subject and that, in turn, *by knowledge we mean* – as I said before – the capacity to act, then we might be satisfied by an understanding that doesn't involve algebra. **You might be able to do lots of things – a lot of *acting* – with knowledge that is not as abstract as algebra.**

Thank goodness for that. I'll go along with this idea that abstract is a de-sense-itis-ing process, but I draw the line at algebra. Life's too short!

But I don't want to *fake it*, Bruce. I really want to *understand* something about this stuff.



Fair enough. **That's one of the reasons I had for writing this stuff about understanding science.** Most people aren't up to algebra and calculus and computer programs, **but they can do better than just looking at things and trusting their hunches – or intuition**, as we've called it. Everybody can be knowledgeable to some extent. **Everybody can act a bit like a scientist!**



This kind of *acting* isn't faking it, Jane – I mean that at least you will *behave* like a scientist, to some extent. **We can do a lot of acting and behaving scientifically without the heavy duty maths.**

And everybody can act a bit like an *actor*, too.

Absolutely, Jane – or *relatively*, as the case may be. That *bit of a scientist* means that the situation can be described at **some level of abstraction in a consistent way** and then **related back to sensual experience.**

That sounds nice.

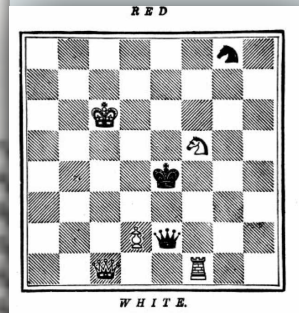


Thanks – I thought that you'd like it. **So you can see that we have a series of stages** – or levels – of abstraction and the game is to work our way back to basic experience from that level. **It is rather like a game**, in that each stage *has an agreed set of elements and rules* and the whole series of stages are linked by rules.

Your *stages and acting* are a bit different from the ones that I'm used to, Bruce. Sounds more like *chess* to me.

I'm catching on fast, Bruce.

Yes, it's a bit like chess – in fact, that's a rather good analogy to use...



Indeed! You're a much better chess player than I am, so you can think of progressing across the chess-board as *going to greater levels of abstraction* – a kind of process of induction where you infer more general statements about a situation from the particular information that you have gathered. **Moving backwards is like deduction** – because the **more general, or abstract the statement, the wider the range of less-abstract situations can be described.**

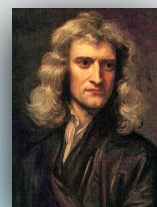
And how do you win in this game?

In this case *winning means getting back to home base of concrete experience without tripping over any flaws in your reasoning.* Winning can also mean getting to the highest level of abstraction that you can.

Why is that *winning*?

Maybe that's a value judgment, Jane, but **higher means that one can perceive a greater degree of generality about a situation.** It means that you can act in a wider range of situations with the *knowledge* that you have gained.

Careful! – You're losing me! **Could you provide an example?**



Okay – let's take Isaac Newton's famous – or *legendary* - apple incident

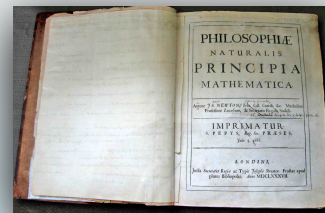
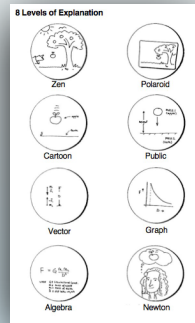
Newton? **The story where an apple fell on his head?** – I thought that was a myth like the *flat earth* myth?

What do they win?

Wow – very impressive, Bruce. But I think that we're getting a bit ahead of ourselves. **I'd like to understand your scheme in general terms** – even if I can't ever get to solve equations. Let's get back to the beginning. **So you're saying that adults can also be in a perfectly concrete state of mind?**

*As an unperfect actor on the stage,
Who with his fear is put beside his part...*

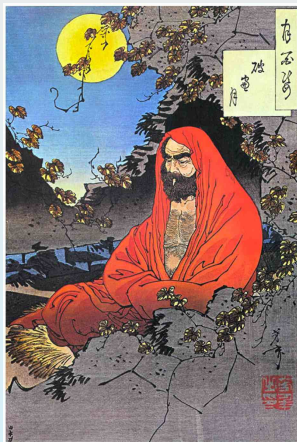
Well – it's somewhere between a myth and a legend. Yes – that one, more or less. Story has it that he conceived of the algebraic equation in a flash of inspiration. But, **to spread the chessboard out**, one could, at **square one** at one end of the abstraction scale, observe a lot of apples and then say **apples always fall to the ground when their stems break**, or at the other end, at *square eight*, say **f equals G times $m(\text{one})$ times $m(\text{two})$ divided by r -squared**. The first case only applies to the class of objects called apples on trees, the latter applies to all objects – **it's the most general statement one can make** – without going into Einstein's general theory of relativity. So – **the person who can make the most general statement wins.**



Satisfaction, Jane – and maybe another research grant to come up with some more equations. For example, the Navier-Stokes equations, which are central to modeling weather and ocean currents, depend on the equation in Newton's second law of motion.

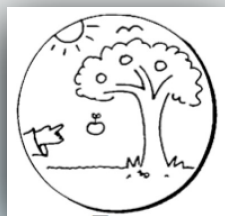
Hmm.. **let's look quickly at that word perfectly.** These *eight stages* are idealized – like the way **Plato thought of essences or ideal states or forms**. In practice, things are less than perfect...

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Indeed, Jane. As we discussed, **the ideal first state or stage is where we understand things wordlessly.** And by *understand*, we mean that we can *do* things – we have **a capacity to act** – that is, **successfully perform intended actions** – without reference to words or images. We *all* do this to some extent – **we call it skills or tacit knowledge.** The difference being that **with skills is that we have a very limited range of responses to a wide variety of situations.** When one exists entirely, continuously and successfully in that state, one is – in the **Zen Buddhist sense – enlightened.**

Isn't the notion of *understanding* is a bit of an **oxymoron** at this stage, Bruce? How can you **explain something wordlessly?**



That's what all the fuss is about in Zen Buddhism, Jane – the enlightened master trying to convince students that by **clearing their heads of that incessant inner chatter by meditating and performing certain exercises, they will understand everything that needs to be understood.**

Those who speak, do not know – those who know, do not speak.

I'm speechless!



A lot of the descriptive part of Zen is in the form of **koans**, which **seem like nonsensical riddles to the uninitiated**, but serve as a metaphor for principles of reality beyond the private opinion of one person.

– which is rather like John Ziman's *Public Knowledge and Reliable Knowledge* approach to Western empiricism – I think that's why Zen has been fairly popular with physicists for a long time. *Explaining at this stage goes no further than wordlessly pointing at the situation* and indicating to the student that they should meditate on it until they *understand* it.

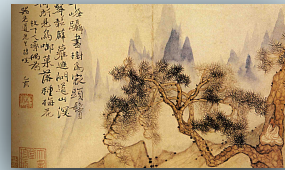
Like the Psalm 'be still and know that I am God'



*Against that time, if ever that time come,
When I shall see thee frown on my defects,
When as thy love hath cast his utmost sum,
Called to that audit by advis'd respects;
Against that time when thou shalt strangely
pass,
And scarcely greet me with that sun, thine eye,
When love, converted from the thing it was,
Shall reasons find of settled gravity;
Against that time do I ensconce me here,
Within the knowledge of mine own desert,
And this my hand, against my self uprear,
To guard the lawful reasons on thy part:
To leave poor me thou hast the strength of laws,
Since why to love I can allege no cause.*



Yes, Jane – as far as I can tell, I think that they were getting at exactly the same thing. **The only problem with Zen Buddhist enlightenment is that you can't just stare at the sky and become a competent climatologist** – although some people claim that they can. **It seems that the Zen approach is more viable for so-called traditional societies where things changed slowly enough for evolved wisdom to be used.** For our immediate problem, the climate is changing too fast to rely on a couple of generations of wisdom, but too slowly for one person's practical experience to be useful. We need the Navier-Stokes equation today.



!

It looks as though the kids are about to come in for ice-blocks. We'll have to continue this discussion later, Bruce.

Chapter 11

FALLING FOR YOU

In which Bruce and Jane develop the Second stage of explanation. Jane gradually develops a better perspective as Bruce describes the gravity of the situation.

Claude Monet (1840–1926) *Monet's garden at Vétheuil*



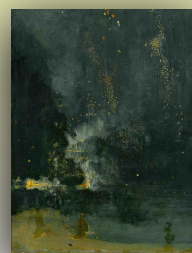
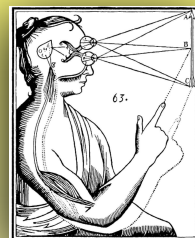
We've set the kids up finger-painting with Mum, Bruce, so they should be busy with that for a while. They always have so much fun with her and some of their efforts are beautiful and interesting – **they could be hung on the walls as *abstract art*.**

I certainly agree with you, Jane. **I like the way that your mother keeps the focus on the *enjoyment* aspect of it...**

Hmm... I said *fun* – and you said *enjoyment* – like they were **two different things?**

I think so, Jane. Certainly **they are both about *pleasure***, but to me, ***fun* is essentially visceral** and ***enjoyment* is essentially cerebral.**

That sounds very like **Descartes' mind-body distinction** to me, Bruce. All that giggling and running around doesn't *sound* very cerebral. **I don't think that Mum is trying to make the kids into little Whistlers or Picassos.**



I'm sure that she isn't. But you might notice how **their finger painting has changed over the past couple of years.** When they first started, it seemed that all the *fun* was about the oozing of the paint through their fingers and the squishiness of applying it to the surface of the butcher's paper. **Your mother rewarded them by laughing and other sounds of approval** when they directed their efforts towards the paper rather than each other's faces. With time, they got more interested in colours – and she chimed in with the names of the colours – **and now they are making all sorts of patterns** – some of them blobs and some of them lines, to which she says ***pretty* or *beautiful* or *gee* – *that's amazing*** and so on. **And some of those blobs and lines are starting to look like people, animals and chairs and tables.**

Yes – Mum's very good at encouraging the kids to explore without pushing them to perform for her.

*O truant Muse what shall be thy amends
For thy neglect of truth in beauty dyed?
Both truth and beauty on my love de-
pends;*

*So dost thou too, and therein dignified.
Make answer Muse: wilt thou not haply say,
'Truth needs no colour, with his colour fixed;
Beauty no pencil, beauty's truth to lay;
But best is best, if never intermixed'?
Because he needs no praise, wilt thou be dumb?
Excuse not silence so, for't lies in thee
To make him much outlive a gilded tomb*



Very interesting, Bruce – but where is all this heading? We seem a long way from explaining explaining and even further away from explaining *climate change*.

Wow! – I didn't think that finger-painting was so deep, Bruce. But, as interesting as all this is, it seems like a bit of a digression. I thought that we were going to look at the next stage of your *eight-stage model of understanding*.

How so, Bruce? If – as in your *stage one* – meditating-on, praying-about and pointing-at climate change don't convince me, **what do we do next?**

I guess it's **Piaget at work**, Jane – a **gradual shift from the concrete to the abstract**. As always, there's a mix of both. At the moment, **the kids occasional thoughts are stimulated by their actions**. With time – with any luck – it will be the other way around. As the Buddhists say:

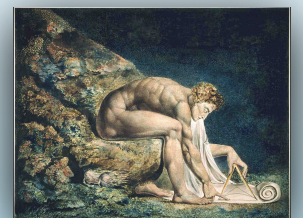
*Right view yields right thought
yields right action.*

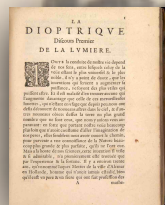
In my view, many people somehow seem mentally stuck at an early age and **their thoughts are a crude rationalization of their uninformed feelings**. They may be very skilled, but they don't deal very well with **new situations that require abstract thinking to resolve**.

We are, Jane – we are. Everything's connected:

*To see a World in a Grain of Sand
And a Heaven in a Wild Flower,
Hold Infinity in the palm of your
hand*

And Eternity in an hour





The next stage – or the **second level of explanation** is the huge quantum leap in mental activity as **we leave the so-called real world of direct and immediate experience** and enter the so-called **world of abstraction**. The second to seventh stages are really just increasing degrees of abstraction – that is, **things look less and less like the reality of everyday experience**.

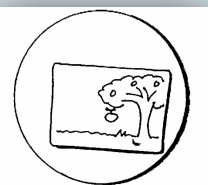
So if you called the first stage *Zen*, what do you call the **second stage**?



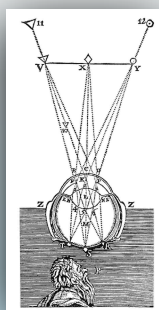
I wrote this paper on explanation and understanding **before the era of digital photography** – I called it the **Polaroid** stage.

I guess that there are now a lot of young and enquiring minds **who wouldn't have a clue what a Polaroid photo is or was** – just think of our own kids in a couple of years' time.

But I hope that there will be young and enquiring minds who care about epistemology in a few years' time, Jane. *Polaroids* were the nearest consumer technology that we had to **instant photos** until digital cameras became commercial around the turn of this **century**. **Let's re-name this second stage the photo stage**, as everyone now can imagine looking at the image on the back-screen of their digital camera, enlarging it for details and **even taking a series of photos in rapid succession or even a movie**, that they can then freeze-frame their way through to look at details.



It's something that we now seem to take for granted in our visually-saturated world,



Like so many things that we take for granted, Jane – **being able to make three-dimensional sense of a two-dimensional image is a pretty exciting thing**. It's the first step in visual abstraction. Perceptual **psychologists** and **physiologists** have been looking at this stuff for years.

Come to think of it, Bruce, it goes way back before the era of perceptual psychologists and physiologists.

Well – *Western art* was, from the Renaissance up to the middle of the 19th century, underpinned by the logic of perspective in an attempt to reproduce an illusion of visible reality.

The advent of the camera changed all of that. At first the Realists used the fairly primitive black and white photos to help construct more realistic coloured paintings, but as photography improved, painters moved to impressionism and other artistic forms that essentially went beyond photographic imagery.



Oh?

Which, I suppose, accounts for the rather child-like appearance of Medieval art. You're the art expert here, Jane – although I know a bit about the history of perspective. I



got interested in it doing technical drawing at high school. Not surprisingly, our teacher taught us all the techniques for creating realistic looking perspectives, but he didn't mention that it was an eleventh-century Persian – actually an Iraqi – named Alhazen



who worked out all the theory.

That good 'ole *encyclopedia*, again, Bruce?

Oh! The camera obscura and the Hockney-Falco thesis! We read about that in our *art history classes*.

Indeed! And I recall that artists were assisted by optical devices long before the advent of the camera in the nineteenth century.

Is this another one of your turkey stories, Bruce?



Err... I'm not up on the *thesis* part of this, but I was pretty proud as a kid to have re-invented the camera obscura.

The Hockney-Falco thesis, Bruce. These guys thought that the great increases in technical accuracy of Renaissance art was due to the use of *camera obscuras* and other early optical devices.



Not quite – but it dates from about the same time. One of the walls in my sleep-out-bedroom was made of corrugated iron and had a few old nail-holes in it. **The whole room became a *camera obscura* movie theatre for me, with pictures on the wall opposite the corrugated iron.** I wondered why everything was upside-down until I read about it in my encyclopedia. **Later on I read that the idea had been around since Aristotle,** but it didn't mention anything about the ... what's-their-names' thesis. **What was that?**

Art is that which transcends technique, Bruce.



Why not? **The *art* isn't the *technique* – is it?**

Fair enough. **But creating new techniques is an art, too.**

So what does all this amount to, Bruce? **As interesting as it is, how does it tie in with *explanation part two*?**

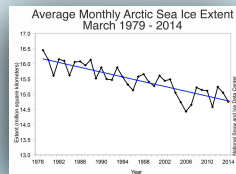
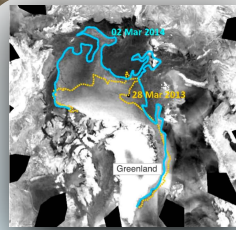
So is stuff at this *Stage* any use to us for looking at *climate change*, Bruce?

Oh – just some insights into how challenging it really *is* to interpret – or make sense of – a ***flat image***. **By *make sense*, I mean *how we relate these static blobs and lines to an ongoing dynamic reality*.** Unlike holograms and a range of images that require special glasses for viewing, **ordinary flat images, by definition don't provide any *real depth perception*** – that requires each eye to see a different image – stereoscopy, it's called – **we have to reconstruct and imagine reality from a series of learned cues.**

Looking forward, Bruce. **But I heard somewhere that there was a lot of debate about melting ice.**

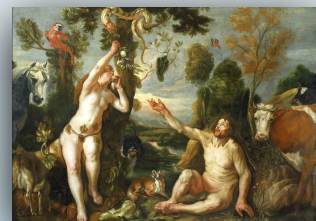
Fair enough – **but where does that leave us?**

But how does this turn into an explanation?



Certainly. For example, **examining the change in area of ice masses such as glaciers and Arctic ice uses photos** – but there’s a good example of the limitations of flat images – **they don’t tell us the *volume* of the ice – only its *area***. We can’t get adequate depth information from photos alone – you need *graphs* and other things that we’ll come to later.

Yes, it’s pretty complicated – and we’ll get around to that soon. **But keeping focused on *explanations*** – the wide range of optical illusions that we see in psychology texts, kids’ encyclopedias and occasional annoying advertisements **show how easy it is to fool our visual perception**. The history of the development of so-called realistic art suggests that **a person who hasn’t been coached in image interpretation from an early age will have difficulty making sense of these images. It’s a huge mental leap.**

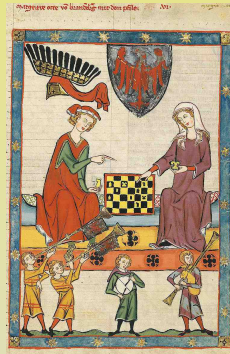


It means that we actually accept a whole bunch of tacit and explicit rules when we look at an image. As a *level two* explanation, we can imagine that we have captured an image of reality – a photo or realistic painting – and we then set about to examine what is in it – the particular bits – like a tree laden with apples, an apple falling, the ground, as well as, perhaps, the sky, a cat in the tree and a dog apparently barking at it. **And we have posed the question: *why does the apple fall to the ground?***

Or – *the Devil made me do it*. Tautological – like *it falls because it's in its apple-nature to fall*?

Explanations at this stage hardly look like the explanations that you and I and lots of people would usually accept as such. Having frozen the scene-of-interest, we can see a lot of possible causes – including *ripe fruit always falls to the ground, the cat pushed it when the dog barked, the wind blew the apple off*, and so on. These explanations are almost tautological.

So – we now have *two squares on our chess-board*, Bruce – the first is about *wordlessly pointing* and the second is a *picture that we've tried to make realistic* and that we have learned to look at and describe. So each square on the board provides us with a particular picture with various things in it that may – or may not – relate to each other or the thing of interest. **Our form of explanation is a description of the way the things in that picture relate to each other?**



Exactly, Jane! You might notice that this is often **how we explain things to small children** – it might seem like a bit of a cop-out, but often it's okay, **because all they really want is reassurance that what they saw actually happened** and they haven't got the mental stuff – that we're going to get to soon – to process it any further. **Historically, many explanations in Aristotle's time weren't any more sophisticated.**

I couldn't have said it better, Jane. **But a full explanation is a bit more than that.**

This is where the chess-board comes in, Bruce?

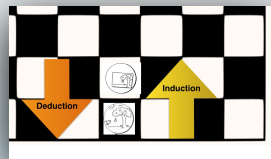
What about a bit of **role-play** here, Bruce – it might help to fix the idea with me.

Good question, Isaac. Let's watch the apple tree and see if another apple falls. Yep... there goes another one...

Because that's what apples do when they're ripe, dear.

Errr...let's see. Well – see where the apple joins the branch?

I'll take a picture with the zoom on the camera, Isaac. Now you can see on the picture that little brown stick at the top of the apple – called its stem. It's got a little soft yellow spot where it joins the branch. When the apple is really ripe that gets really soft and breaks and the apple falls. Now let's watch the tree again...



Yep. Having examined the photo and come to some opinion about **cause-and-effect relationships**, we can then move **deductively** back to *square one* and have a another look at the apple tree – we might wait and **watch wordlessly for another apple to fall.**

Good idea, Jane. Okay – you almost have to imagine that you are a child to *see it using only the first two squares* – using more abstract squares than number two isn't allowed. Imagine the young Isaac says: 'Mummy – **why did that apple fall to the ground?**' You assess his level of cognitive development and say ...

But why, Mummy, he says...

But why, Mummy?

I can't see it very well from here, Mummy.



So - that's what apples do when they are ripe?

Look, Mummy, there's goes another apple. It must be ripe. **And the cat just fell out of the tree – it must be ripe, too.**

No, Isaac, the cat wasn't ripe – it just slipped.

**Mine eye hath played the painter and hath steeled,
Thy beauty's form in table of my heart;
My body is the frame wherein 'tis held,
And perspective that is best painter's art.
For through the painter must you see his skill,
To find where your true image pictured lies,
Which in my bosom's shop is hanging still,
That hath his windows glazed with thine eyes.
Now see what good turns eyes for eyes have done:
Mine eyes have drawn thy shape, and thine for me
Are windows to my breast, where-through the sun
Delights to peep, to gaze therein on thee;
Yet eyes this cunning want to grace their art,
They draw but what they see, know not the heart.**



Chapter 12

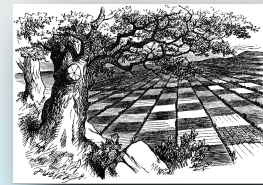
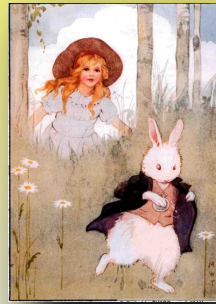
SUBSTANCE AND SHADOW

In which Jane and Bruce explore the Third Stage of Bruce's explanatory model. They find that there's more to art than meets the eye.

Michelangelo Buonarroti
(1475-1564) *Last Judgment*
(detail), Sistine Chapel. An
example of use of the *cartoon*.

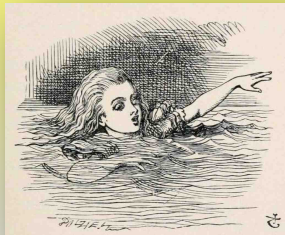


The kids are watching the [Alice in Wonderland](#) video – for the *fiftieth* time I reckon – so we've got a bit of time for a cup of tea and continue *our* journey down the [Rabbit-Hole](#) into the *Land of Abstraction*. Where do we go to next, Bruce?



Straight from rabbit-hole to [chess-board](#), Jane. Say! We're already there – along with the kids – in the land of cartoons!

[Curious and curiouser](#), said Alice. This pool of tears is certainly a long way from the dry land of climate change, Bruce.



Not as far as you might think, Jane. Climate science uses an enormous amount of imagery to interpret and display ideas. We'll come to that in good time.

Lead on, my lovely [White Rabbit](#)!



Hmmm.... Where to start? Well – we left reality and fell down the Rabbit-Hole when Alice wanted a book with pictures. In our case we said that we were moving across a chess-board – but never mind – just mixing up our metaphors. But we've found that *literal pictures often seem to have too much spurious information in them* for us to 'understand' what's going on. What are we to do?

I get it, Bruce – Lewis Carroll's fictional characters are *literary caricatures* of prominent Victorians – and [John Tenniel's](#) drawings in the original Alice books are visual caricatures. Certain details are omitted and some features are exaggerated to draw attention to that element.

Right on, Jane. Lead on.

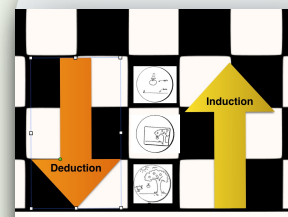
I love art and illustration, Bruce – it's an essential part of theatre. I've been interested in the history of illustrations ever since undergraduate days.

In some ways, **theatre is just a series of artistic poses – and vice versa**. These days we do **storyboards** of the major scenes and poses of plays before we produce them. **Many famous paintings are someone or something striking a pose**. As such, storyboards are a fairly recent invention – usually attributed to Walt Disney in the late 'twenties.



I guess that what I'm trying to do at the moment – **develop a bit of a Mickey Mouse storyboard on explanation**.

Yes – let's try to keep to the point, Bruce – **I'm all ears** – for you.



The challenge now is how we move across the board to the next stage – **the *third stage*** – if *pictures, such as photos*, are unnecessarily complicated, the question is: **what do we take out and what do we leave in?**

We leave in the **essential** features, Bruce.

Ohh! – that *e-word* again! And what is **essential** and what *isn't*, Jane?

Nicely trapped, Bruce! – a **White Rabbit trap**, I assume. I guess it depends upon what we want to give prominence – what is important to us.

How do we know **what is important** and what is **irrelevant**?

Experience, I guess?



Spoken like a true empiricist! An hypothesis followed by some observations.

I can use the **Force**, now, Bruce. **The Dark Side is calling**.

So **your intuition and sub-conscious experiences** shape your senses so that you respond almost automatically to certain visual cues. **What is your *first cue***, Jane?

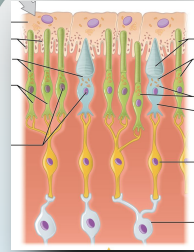
Well – **the first thing I notice is colour**. And it seems like that's **the last thing that you notice**. I bet if you closed your eyes **you couldn't tell me the colour of my skirt**.

Oh, yes – **at the restaurant. Meno was on the menu. Tell me – again.**

That sounds a bit left-field?

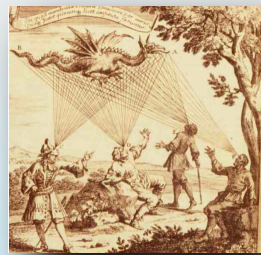
Superman seems to have not heard this news. Anyway – **the point being?**

I'm still curious, George....



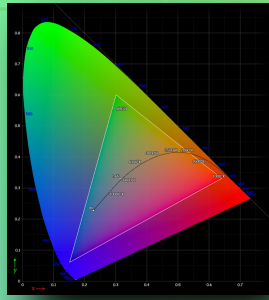
Maybe not, **but I could tell you that you look great in it**. But there's a difference between what I notice first and what I *then* pay attention to – I think that most people notice colour first – **our eyes – both males' and females' – are geared to see colour first**. That's what the **cones in our eyes are for**. That's something that has been known for a long time – even if it wasn't stated in such scientific terms. **Remember Socrates and Meno?**

Socrates said: '**Figure is the only thing which always follows colour**'. He was using **the relationship of colour to shape, or figure**, as an example, while trying to get Meno to understand the basic nature of virtue.



Maybe, but Socrates labours the point in *Meno* and expounds it at length in his dialog with **Timaeus** to the extent that **he seemed to have spent some time looking at the nature of perception**. Of course, in those days **they thought that vision came out of the eye**, rather than **light going in**, but that was a mere detail.

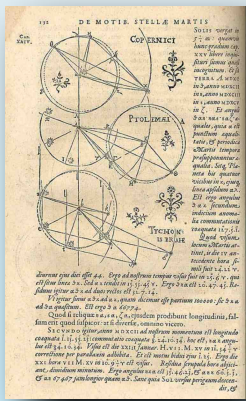
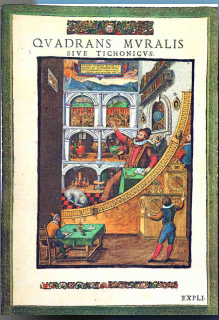
Well – **there are many points to light – maybe a thousand** – but I'll stop beating around the bush.



...so fill me in on cartoons and explanation, Bruce.

Hold it there, Bruce! Did I hear you mention values in the context of scientific objectivity? You can't sneak that past me!

Talk about elliptical!

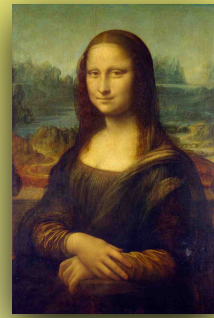


Essentially, when it comes to making visual images that we can understand – visual perception – we've only got three things that we can vary – *lightness, saturation and hue*. Things can range from light to dark, intense to dull or vary in colour. But after the first flash of colour, we settle down to look at details of *shape and size*. Ultimately – do you recognize Mickey Mouse from the colour of his pants or the shape of his ears? How can we tell that it's Mickey – or is it a sabre-tooth tiger? We've got twenty times more vision receptors-*rods* – that only see black and white – than colour receptors – *cones*. So we have got a great built-in capacity to discriminate shapes.

In this *Third Stage*, all – or most – *irrelevant* detail is omitted from the picture. *Irrelevant*, of course, is a value judgment.

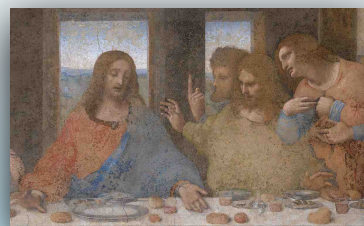
All data is value-laden, Jane – or is *subjective* to some extent, in that, when we reduce everything that we perceive to a manageable data-set, then we leave things out. What we leave out is a matter of judgment – we might think that it is irrelevant or spurious and it might turn out that what we have omitted is very important. For example, Medieval and Renaissance astronomers rejected a lot of their measured observations because they implied orbits that weren't circular. That circularity was laden with the values of Platonic and Christian perfection. It took Tycho Brahe to make measurements so consistent that their accuracy could not be denied – so Kepler propounded that the orbits were, in fact, ellipses.

But back on *Planet Cartoon*, I must say, that when I think of that grand historic sweep of art, that many great artists – such as [Da Vinci](#), [Michelangelo](#), and [Blake](#) – just to mention a few – used a kind of **cartoon-outlining extensively in their paintings**. Many others -[Titian](#), [Velasquez](#), [Joshua Reynolds](#) and the ‘[grand manner](#)’ portraitists used dark backgrounds or deep shadows **to emphasise the features that they thought were important**. Come to think of it – Reynolds was never content with a map of the face and a literal description of externals, but sought to fix on his canvas the permanent essentials of character in a large and dignified way. His effects of light and shade are always broad and simple, and he avoids a multiplicity of small lights that lead to pettiness of effect and distract attention from the [being of the sitter](#). **He was really more Renaissance than the Renaissance** and he set the style for overblown nineteenth century romantic art.



*'Ah! yet doth beauty like a dial-hand,
Steal from his figure, and no pace perceived;
So your sweet hue, which methinks still doth stand,
Hath motion, and [mine eye may be deceived](#)'*

Same world – just a different point of view, Bruce.



So there's not really that much difference – in principle – between Tenniel's [Mad-Hatter's Tea Party](#) and Da Vinci's [Last Supper](#).

See – you knew it all already, Jane – I only had to remind you to remember.

Depends on **how much you want to compromise your principles**, Bruce.

That's a very post-modern admission, Bruce!

Okay – I thought that I had you there. **So what – when it comes to explanation – gets edited out of the picture?**

I'm not sure if the kids think that, although they seem to have a **very different reaction to cartoons than to more realistic-looking TV**. It's hard to make a comparison, but **they seem more interested in repeat viewings of Walt Disney's than Tim Burton's version of Alice**.

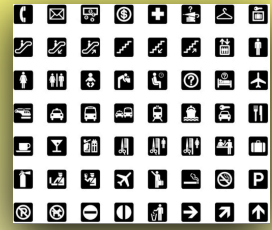


We always compromise – or **apply filters to the world when we look at it**. In **systems theory** we call it *weltanschauung* – or **world view**. You can look at the same situation in many different ways - **just like a GPS map...**

... Just that **in science we try to declare our biases when we apply them**, or 'fess-up when someone else identifies them, Jane. Remember, I said that **science is *reliable knowledge*, not a *God's-eye statement of eternal truths***. It's different in degree, but not in kind, from **personal belief** – it's less strongly held and it's *shared by many*. **Safety in numbers. Just like ants.**



Enough detail is left to determine that it *is*, say, **an apple, a tree and the ground**. Remember, **at this *Third Stage* of explanation we are not so abstract as to lose all sight of things that look real**. A bit of a precautionary measure – I guess. The leaves on the tree are not – we guess – a necessary detail, so they are omitted, so are the blemishes on the apple and the stones and grass on the ground. **Cartoon movement is often distorted, and has jet-like trails or other repetitive marks behind objects of interest**. Again, this is a leap in abstraction, **as reality does not look like a series of**



Umm... **that echoes my semiotics** exactly, Bruce. So where would you put Burton's *Alice* in your scheme?

Hmmm... I agree that we should look at this issue later, Bruce. **Meanwhile, back at the apple tree....**

So how might a *Stage Three* explanation look like in words?

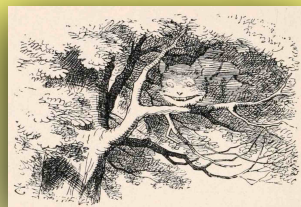


That's a big subject that we might look at later, Jane. But it's interesting to **compare Burton's and Disney's *Alices*** from the point of view of imagery – Disney took a fairly classical cartoon approach to the earlier version, with mainly solid colours with very little shading or textures – **so it *simplified* – or *abstracted* reality.** On the other hand, **Burton's version is a kind of surrealistic post-apocalyptic hyperreality**, with computer generated imagery often providing **even more detail** than one would notice if it were an ordinary film.

Maybe back at *Stage Two* – or even off in another dimension in our Wonderland/Looking Glass chess game. Suffice to say that I loved watching cartoons when I had the chance when I was a kid and it didn't seem to harm *me*.

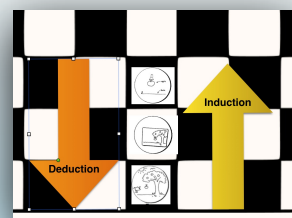
The point of this *Third Stage of explanation* – or the *second level of abstraction* – is to demonstrate that it could have been *any* apple on *any* tree or any day in *any* country etc – that is, a greater level of generalisation compared with a *particular* tree, apple, orchard and so on. **Not only is nature frozen, as in the *Polaroid/photo* – or *Second Stage*, **but it is also *simplified*.** This level of abstraction suggests that experiments can be set up, as the **basic phenomenon does not depend on the particular situation or location as observed.****

Ahh! Now that we have three stages, I can start to see a [trend](#). We'll keep removing features until all we have left is the *essence of pure abstraction* – just like the [Cheshire Cat's](#) smile. So – which way do we go from here, Bruce?



A **typical explanation** at this stage might be 'anything that looks like an apple – or maybe any fruit – will fall to a lower level, with ever increasing speed when it is released on Earth'. It is easy to see that having grasped this general concept, the teacher/ parent or any other explainer **can then take the student back along the chess-board** to the *polaroid/photo* stage to show that actual apples behave like this, and then show the student an apple on an apple tree, at the *Zen* stage, **to convince the student**.

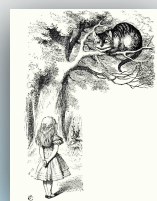
Did you say *figments* or *pigments*? Never mind – I don't want to *just* imagine things – I want to get an **understanding of the real world and climate change**.



That depends a good deal on where you want to get to. **In that direction is concrete reality and in that direction is pure abstraction**. Visit either you like – **they're both figments of our imagination**.

I can't help that Jane. **I'm part of your imagination and you're part of mine. We're [all imagination](#)**.

Speak for yourself, Bruce. **How do you know I'm imagining things?**



You must be, said the cat, [or you wouldn't have come here](#).

*'Weary with toil, I haste me to my bed,
The dear repose for limbs with travel tired;
But then begins a journey in my head
To work my mind, when body's work's expired:
For then my thoughts--from far where I abide--
Intend a zealous pilgrimage to thee,
And keep my drooping eyelids open wide,
Looking on darkness which the blind do see:
Save that my soul's imaginary sight
Presents thy shadow to my sightless view
Which, like a jewel hung in ghastly night,
Makes black night beauteous, and her old face new.*



Would you like another cup of tea, Jane?