# Systematic Innovation


# e-zine

Issue 187, October 2017

In this month's issue:



The Systematic Innovation e-zine is a monthly, subscription only, publication. Each month will feature articles and features aimed at advancing the state of the art in TRIZ and related problem solving methodologies.

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.

Readers' comments and inputs are always welcome.
Send them to **darrell.mann@systematic-innovation.com**



# Eudaimonism: Happiness *&* Meaning

In South Korea, very graciously, I'm known as the 'Father Of Business TRIZ'. Sadly, I've never managed to get the TRIZ community in that country to get beyond the idea that 'business TRIZ' is all about a business version of the 40 Inventive Principles. The heart of the problem, I believe, is a reluctance to embrace the idea that the key difference between technical and business problems is that the former is largely about complicated situations and the latter is inevitably about ones that are inherently complex. The two, therefore, cannot be treated in the same way. Solve a contradiction in a technical environment and almost inevitably, you'll find yourself heading in the direction of a more ideal solution. Solve one in a complex environment, and you may well not be. There's almost no such thing as a simple solution in a complex environment, and as such, we shouldn't expect that the Eureka-like deployment of and Inventive Principle is going to unlock a breakthrough success. Key word in that sentence: 'almost'. Solving a complex problem with a single Principle provocation isn't impossible, but it might just as well be if you haven't spent some time making sure you understand the 'first principles' (Reference 1) from which the system behavior is emerging.

Last month, I wrote a blog article about a – some might say 'the' – high-level psychology-related contradiction between happiness and meaning (Reference 2). The contradiction was relative simple to draw on a 2x2 matrix as follows:

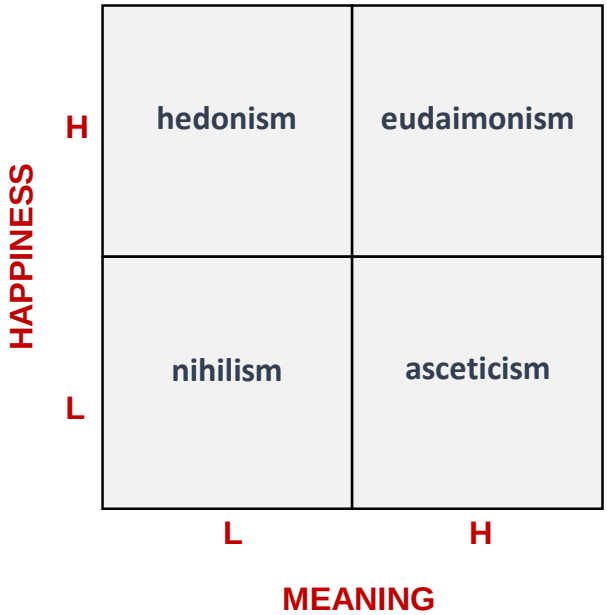


**Figure 1: Happiness-versus-Meaning 2x2 Matrix**

Here's a problem that we might simply choose to examine as a 'Positive Intangibles' versus 'Meaning problem on the new version of the Business Contradiction Matrix. It would very swiftly inform us that, sure enough, we're not the first people to desire solutions to this conflict, and that the ranked list of Inventive Principle strategies used by those that had been successful before us were, respectively, 17, 3, 7 and 25.

So far so good. But now comes the real problem: *to what* do we apply these Principles? What other dimensions? Local quality relative to what homogeneity? Nesting what inside what? Unless I have a specific context I have little chance to make any kind of meaningful

connection in any of these cases. And, worse, even if I do have a specific context – if I tried to apply these Principles to my own life, for example, I still can't be confident I'm doing the right thing. The problem here is that unless I understand my own 'first principles' I may well find myself doing more harm than good when I start thinking about 'Self Service' (or any other Inventive Principle).

How, then, to get to this 'first principle' level?

What Reference 1 will tell me is that the 'first principle' story, as far as human psychology is concerned, starts with the ABC-M model. Autonomy, Belonging, Competence and Meaning all need to be present and heading in the 'increasing' direction. We might imply from this overall direction that 'happiness is the state we attain when all four attributes are moving in the right direction. If this is the case, then 'happiness' and 'meaning' aren't necessarily in conflict. The fact that they often *are* in conflict, perhaps better implies that it is the ABC attributes that better correspond to happiness: what makes us 'happy' is when we feel in control of a situation, feel like we belong to the right tribe and feel that we're good at what we contribute to that tribe. None of which fundamentally implies that we achieve any of those things by adding meaning.

Look at the majority of popular self-help psychology books and they will point us to the pursuit of happiness as the topmost of all human goals and objectives. The Figure 1 Matrix, however, reveals the possibility that I can very easily find myself in a simultaneous state of both 'happiness' and meaningless. I simply do this by living a hedonistic lifestyle. The 'happiness gurus' in this sense have got things strikingly wrong. The pursuit of happiness – a fundamental human right according to the US declaration of independence – may cause me to become a rather shallow person. One suspects that anyone caught in this 'pursuit of happiness' and the aversion to negative experiences can actually find themselves locked in a perpetual oscillatory loop like this:

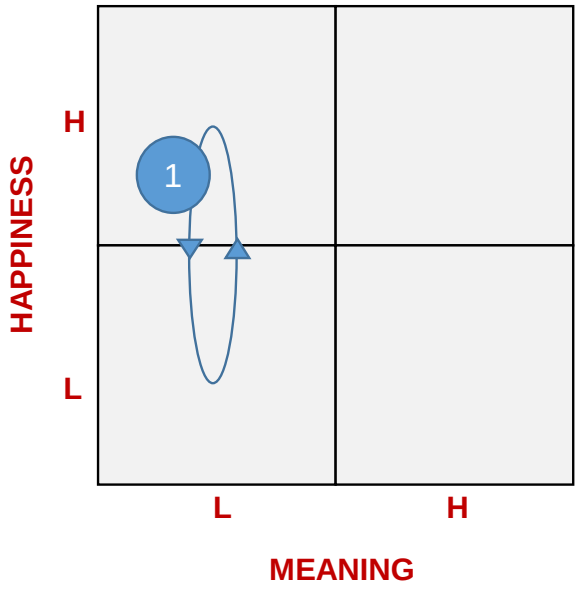


**Figure 2: A Desire To Be 'Happy' Often Triggers Cycles Of Happiness & Depression**

One suspects that this oscillating loop between hedonistic happiness and depression is one lived by many people in the affluent West. We're told that buying a bigger, faster car will make us happy, so we save up our money and eventually reach the ecstasy of ordering one. Only to then find it didn't make us happier at all, and now, worse, there's no money in the bank account, and the car costs a fortune to run.

Breaking out of this loop, requires me to solve a contradiction. Very likely solving it necessitates the realization that I need to turn things around and forget about happiness. At least for a while. Stop drinking; stop spending 6 hours a night couch-potatoed in front of Netflix, get off my backside and go do something meaningful. In other words, I escape the (1) loop and find myself in a second, different, one:

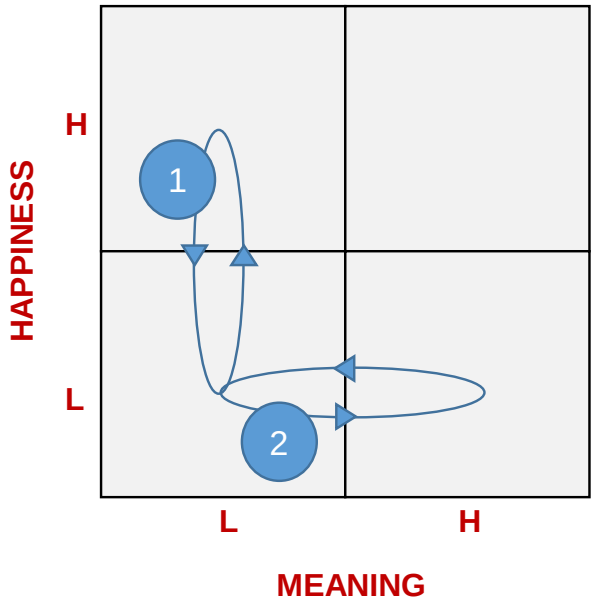


**Figure 3: Loop 2: 'Why Am I Here?'/Whatever I Sacrifice, It's Never Enough**

In terms of the 'ABC gets better' first principle requirement, this second oscillation between nihilistic doubt ('why am I here?') and asceticism is usually about personal sacrifice for the greater good. It is the life of Siddhartha: giving everything away only to find that no matter what we personally offer to others there are many more of them than there are of us. The more I sacrifice, the more I realise how meaningless my sacrifice is in the broader context. Once I realise and solve this contradiction, I might, if I do it right, find myself now locked in a third type of loop:

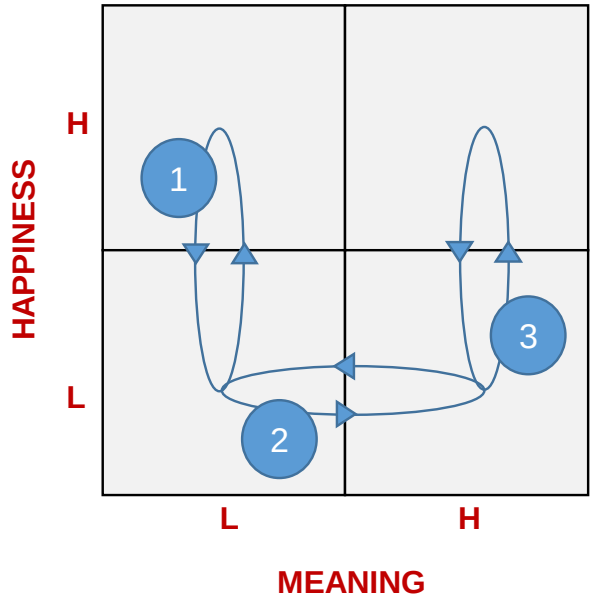


**Figure 4: Loop 3: Glimpses Of Eudaimonism**

When I forget about my personal happiness and recognize that no matter how much I sacrifice I can never make everyone else happy, I begin to resolve the big contradiction: how to be happy and live a meaningful life: I realise that, for a few moments once in a while, my meaningful acts for others bring personal happiness to me. When I'm happy, I'm in turn more able to help others. Loop 3, in other words, is all about recognizing that 'happiness' is not intended to be a permanent state. Happiness in hedonism terms is about being comfortable in your box; happiness in eudaimonism terms is about delivering 'meaning' by getting outside your box. Getting outside your comfort zone is often about recognizing your incompetence, but doing it anyway, learning from your mistakes and ultimately then taking control by attaining new competences.

Finally, then, comes the slippery-slope fourth loop:

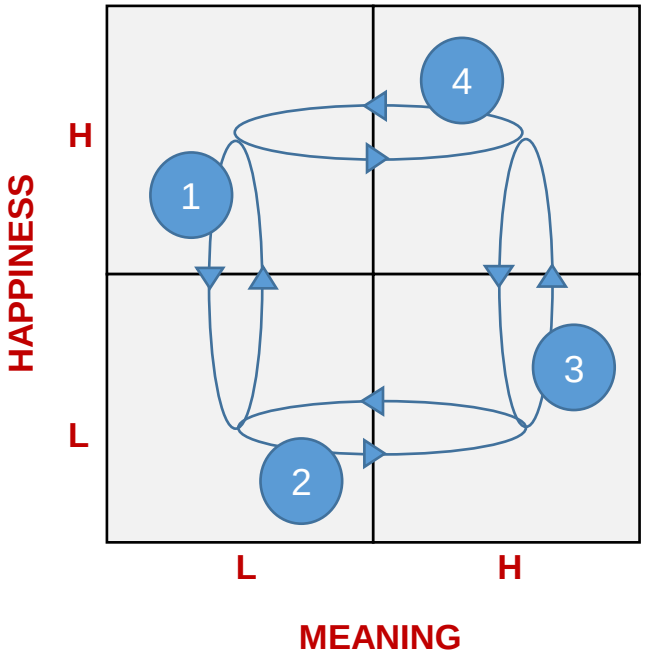


**Figure 5: Loop 4: Slippery Slopes**

This loop is all about 'falling off the wagon', taking our foot 'off the pedal' and generally goofing off from all the hard work. 'I've done such a good job for the world today, that I deserve an evening off'. That kind of thing. Which is, of course, a totally legitimate thing to do. Living a state of permanent eudaimonism is hard work, and requires a lot of energy. A bit of R&R is something we all need. The slippery-slope challenge is when an evening off becomes two and then a day, and then a long-weekend.

The number (4) loop is how we can very easily find ourselves back at Loop (1). Which in effect means that we're in danger of having to start the whole (1)-(2)-(3)-(4) journey all over again. Which may just be another contradiction, if it weren't for the fact that knowing which loop and which quadrant of the picture we're currently in are precisely the other 'first principle' pieces of understanding we need to know before we can start to use the Contradiction Matrix. 'Local Quality' when I find myself caught in Loop 2, nihilist mode means something very different to using the same Principle when I'm caught in one of the other loops.

Know where you are; know which oscillation you're caught in; know that ABC-M are all supposed to be 'getting better', and now you can start expecting that an Inventive Principle

might help you to achieve your next breakthrough. And that's 'simplicity through complexity'.

## References


1) 'Eudaimonism & Philosopher's At Sea', blog article, darrellmann.com, 2 October 2017.
2) Systematic Innovation E-Zine, 'First Principles First', Issue 184, July 2017.

# Spot The Innovation

Something a bit different this month. How many innovations can you spot in this collage?












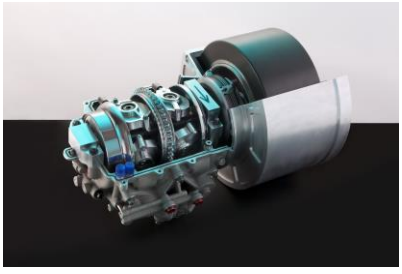



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Answer: 2.

This conclusion is based on our conventional definition of innovation as ‘successful step-change’. Let’s see how each of the attempts shown in the collage fare against this definition. Working our way from the top left…

*Tata Nano* – very definitely a ‘step-change’ in terms of the vehicle’s design. I was working with GM in the US when the Nano was announced, and they were palpably fearful since the cost-reduction ambitions of the project would fundamentally disrupt the tier structure of the industry. Fortunately for GM, the project has thus far not paid back its investment, and so in Tata’s terms it cannot be called a success. The Nano is a classic example of the cruelty of the innovation game: get 99 things right and one thing wrong, and you lose your money. The big failing here, one that still adversely affects the Company, is the realization that very few customers wish to associate themselves with the ‘cheapest’ offering on the market no matter how good it might be technically. What Nano ended up doing was opening up the market for the second and third cheapest cars.

*Airbus A380* – the world’s fully double-decker passenger aircraft features a number of ‘innovations’. The project, however, has achieved a small fraction of its target order-book and thus fails the ‘successful’ criterion. My ears aren’t ringing when I get off an A380, which is great, but Airbus continues to lose money on the whole venture. It’s doubtful it will ever now leave the red and become financially positive.

*Segway* – iconic example of inventor hubris. Dean Kamen’s re-invention of personal transport is exactly that: invention and not innovation. Another project that, despite the elegant gyroscopic self-balance technology, the venture has proved to be a massive financial black-hole. Ironically for Kamen, the product that preceded the Segway – a wheelchair capable of raising the occupant onto two self-balancing wheels – was very definitely an innovation. Kamen and the investors he coaxed into supporting Segway failed to realise that a niche product doesn’t always get to go mainstream. It singularly fails to do the ‘personal transport’ job better than a myriad other transport alternatives.

*Dyson Washing Machine* – having made an enormous success with his cyclone-based vacuum cleaner, James Dyson could seemingly do no wrong. His next target was the domestic washing machine. The ‘step-change’ was an elegant split, counter-rotating drum. As for successful, the project never found its way into the black. A classic case of solving a problem few if any customers had. That plus it turns out there’s nothing aspirational about owning a cooler, triple-priced washing machine than your neighbor, rather they label you as someone with more money than sense.

*Google Autonomous Car* – slightly unfair to call this project a ‘failure’ because in all likelihood it hit the public consciousness as a statement of intent from the Company, rather than being intended as a full commercial venture. It’s very definitely got a number of step-change features, but it’s very definitely a research programme and not an innovation.

*Ford Edsel* – one of the all-time classic ‘failed’ products, the Edsel famously cost Ford an awful lot of money and lost pride. The Edsel utterly fails the ‘successful’ innovation test. On the other hand, it featured a whole string of technology features that a decade later became industry standards. A classic case of the right technologies in the wrong package at the wrong time.

*Tweel* – like a lot of ‘innovators’, Michelin hit upon a good idea – with our help I might add – and very quickly get greedy. The tweel is another niche product that the Marketing folks decide they’re going to turn into the next-big-thing in the domestic car market. When the

domestic car buyer saw it they overwhelmingly voted with their feet to not adopt the technology because it looks dumb. Consequently, Michelin have lost their financial shirts on the project, and none of the niches – small off-road vehicles mainly – have allowed even a fraction of the overall investment to be recouped.

*DeLorean* – unless you count the car's appearance in Back To The Future, the DeLorean's fiberglass and stainless-panel body and gull-wing doors represented yet another automotive industry step-change ego-project failure. A classic example of a big idea with an acute absence of attention to detail. Launching high price 'luxury' vehicles in an economic recession also turns out to be a fairly bad idea. The Company famously went bust two years after the car's launch. Still, it has subsequently given the world the flux-capacitor!

*Tesla* – Elon Musk is perhaps the ultimate example of living the American Dream… the big-thinking entrepreneur with a passion for rethinking everything. Tesla, the step-changing range of electric-vehicles is intended to be one of the cash-cows that will fund the exciting R&D to deliver all the other Brave New World solutions. Sadly, as yet, the project is still burning far more money than it is generating. Living the Dream, Musk is also perhaps – currently – also a great example of what 'too sexy to fail' means: investors and public alike seem more than happy to keep funding those Dreams.

*Furby* – the world's first 'intelligent' toy, a must-have Christmas present in 1998, when the toy was launched, and still selling in enormous numbers five years later, despite the frustrated tears of parents. Furby is the first of our two innovations: the technology was a step-change and, as far as manufacturer, Tiger Electronics, are concerned, Furby has been a massive commercial success… at least so far… let's hope they don't start receiving psychiatrist bills from their now grown-up customers.

*Terrafugia TF-X Flying Car* – no sector attracts deluded designers and investors like 'flying cars'. Terrafugia is one of the latest attempts. They've even managed to get a prototype in the air. While there's definite evidence of technology step-change, this is still 'R&D' and therefore nothing to do with innovation. Another project that will almost inevitably a) burn ever greater amounts of investor money, b) never break-even.

*Fluted Engine Nacelle* – one of the most distinctive features of the new Boeing 787 Dreamliner is the fluted engine nacelle bypass exhaust found on the Rolls-Royce engines. Looking at its order book, the Dreamliner looks set to be a big success. The engine nacelles represent a success that has already paid for itself. And delivered a technology step change. It is thus the second of our two innovations. The irony with this one is that the fluted design was first demonstrated (on one of my projects as it happens) and patented back in the late 1980s, meaning the pay-back gestation period has been around 25 years. Just long enough that the patents are now expired.

*Hyperloop* – another Musk 'big project'. LA to New York in under an hour, or something like that. Great step-change. Great R&D. With a very strong following financial wind, 'possibly' an innovation. In twenty years' time.

*Space-X* – as above. What happens when people have too much money and too little sense of what's important in life. Pure 'investor candy'.

*Google Glass* – another of Google's R&D projects allowed to go viral before the technology was really ready. Great PR, some very nice step-change technology, and a big investment black-hole. This one is very likely to 'become' an innovation in the future. Now that the 'peak of inflated expectations' and 'trough of disillusion' stages have passed,

Google Glass can finally start getting on with delivering tangible benefit across a whole range of high-value niches.

*Colgate Beef Lasagna* – sadly no double-bluff with this one: teeth-cleaning convenience food might be classed as some kind of step-change, but this turned out to be one of the most disastrous product launches ever. Strangely, the public somehow weren't able to make the connection between lasagna and toothpaste.

*Torotrak* – the continuously variable gearbox 'innovation' every mechanical engineer has been wanting to succeed since the concept appeared over 20 years ago. The technology makes for a beautiful piece of 'Swiss-watch' engineering, but few if any customers have as yet been convinced the benefits the technology offers outweigh the costs and harms. Great example of too much optimization thinking on a design crying out for two or three more step-changes.

Sometimes people challenge our research finding that 98% of innovation attempts fail. Hopefully this small sample reveals why the whole damn innovation game is so difficult.

**Not So Funny – Bad Punctuation**

Punctuation can be a tricky beast. Too much. Too little. Wrong place. Wrong type. So many potential mistakes. So many Inventive Principles:

Principle 1


Principle 2




Principle 5




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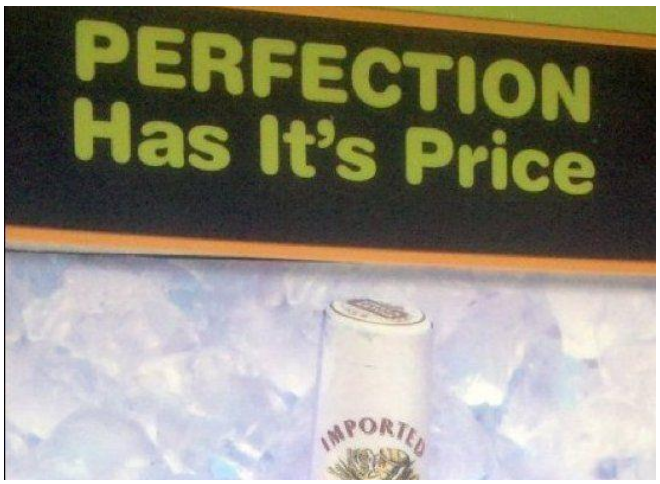
Principle 16 (with a bit of 17, and maybe the opposite of 27 thrown in for good measure)


Principle 24







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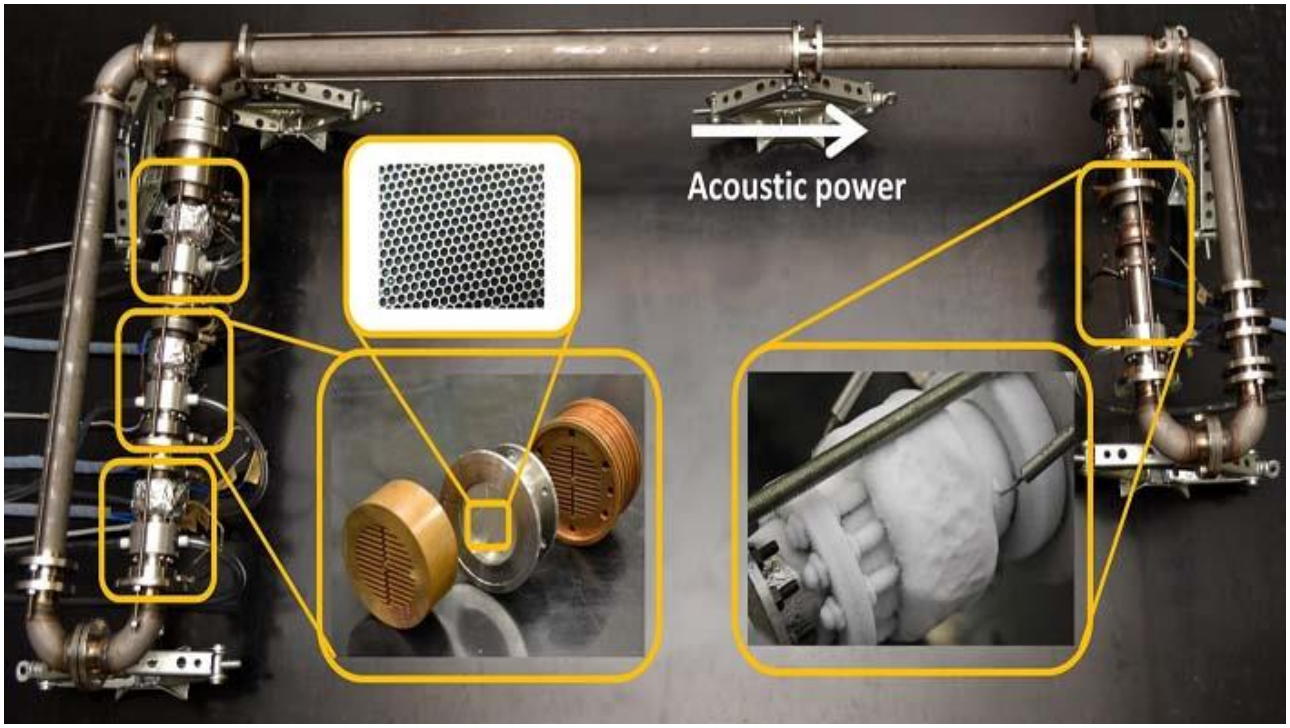
Principle 31


And how about this, probably my favourite, as an example of Principle 40. A veritable festival of mistakes:

**Patent of the Month – ThermoAcoustic Engine**




Well, it's never going to win prizes for readability, but patent of the month this month is nevertheless an elegant evolution of the thermoacoustic engine. US9,777,951 was granted to a quartet of inventors at Tokai University in Japan on 3 October. Fortunately, there's quite a lot of coverage of the basic problem solved by the inventors in the online technical media. First up, a brief introduction to the basic technology:

Thermoacoustic engines work by heating, cooling and oscillating sound waves created by the thermal expansion and contraction of gases such as helium in enclosed dedicated cavities. TA engines were first devised in the late 1990s and early 2000's by researchers in the US, leading to researchers worldwide beginning projects to develop high efficiency TA engines that convert heat into useful power. However major barriers to their application have been operating systems at a high enough efficiency at temperatures of less than 300°C and developing a robust enough design for everyday use.

The researchers from Japan have now successfully demonstrated a refrigerator powered by soundwaves from a thermoacoustic engine that runs from waste heat.

The coldest temperature the refrigerator is capable of is -107.4°C when the waste heat fuelling the thermoacoustic (TA) engine is 270°C.

The high efficiency multistage-type thermoacoustic engine does not have moving parts and operates at less than 300°C, the temperature of more than 80% of industrial waste heat, according to the researchers.

Shinya Hasegawa, associate professor of Prime Mover Engineering at the University said: "TA engines do not have moving parts, are easy to maintain, have potentially high efficiency, and are low cost.



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“My goals are to develop TA engines that operates at less than 300°C with more than 30% efficiency, and also to demonstrate a refrigerator operating at -200°C at these low temperatures.”

The travelling wave thermoacoustic refrigerator (TWTR) consists of three etched stainless-steel mesh regenerators installed within the prime mover loop and one in the refrigerator loop. This configuration triggers thermoacoustic oscillations at lower temperatures and yield a refrigerator temperature of less than -100°C.

The diameters of the regenerators ranged between 0.2 to 0.3mm and their lengths were 30 to 120 mm, depending on location. Furthermore, the TWTR had heat exchangers in the form of parallel copper plates (1.0mm thick and 27.0mm in length) with a 2.0mm gap.

The thermoacoustic energy conversion of this design is determined by the ratio of the diameter of the flow channel and thermal penetration depth, and the phase difference between the pressure and cross-sectional mean velocity.

The coefficient of performance (COP) increased as the temperature of the heat exchangers in the primer loop was increased and the maximum value of COP was 0.029 at 260°C, and the corresponding cooling power was 35.6W.

The researchers also obtained gas oscillations at 85°C —that is lower than the boiling point of water—thereby opening up possibilities for applications of this technology for refrigeration and power generation using low temperature waste heat in factories and automobile engines. In addition refrigeration to −42.3°C was achieved at 90°C and the efficiency of the Tokai University TA engine was 18% at minus 107 °C.

The basic problem being solved is the conflict between the desire to increase efficiency of the engine being hindered by the need for higher temperatures than are easy to achieve. Here’s what that problem looks like when mapped on to the Contradiction Matrix:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Loss of Energy (27)

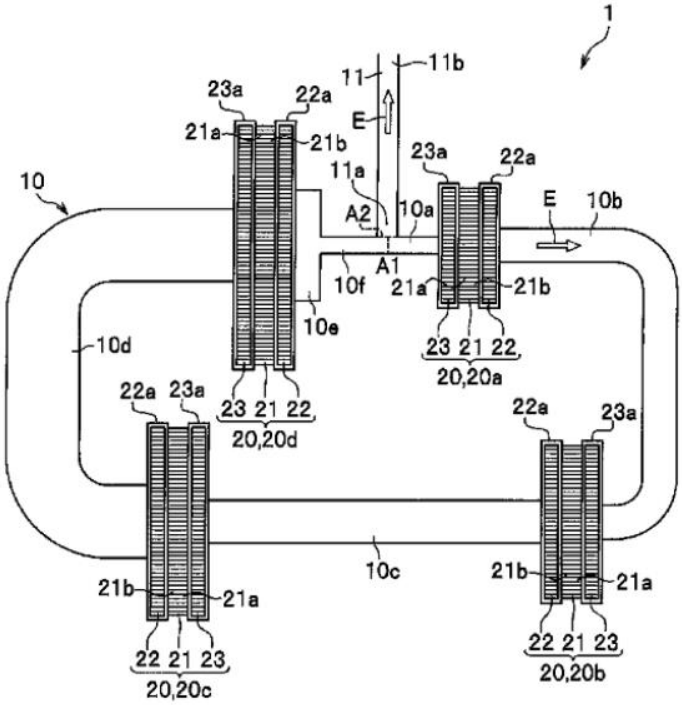
WORSENING PARAMETERS YOU HAVE SELECTED:

Temperature (22)

SUGGESTED INVENTIVE PRINCIPLES:

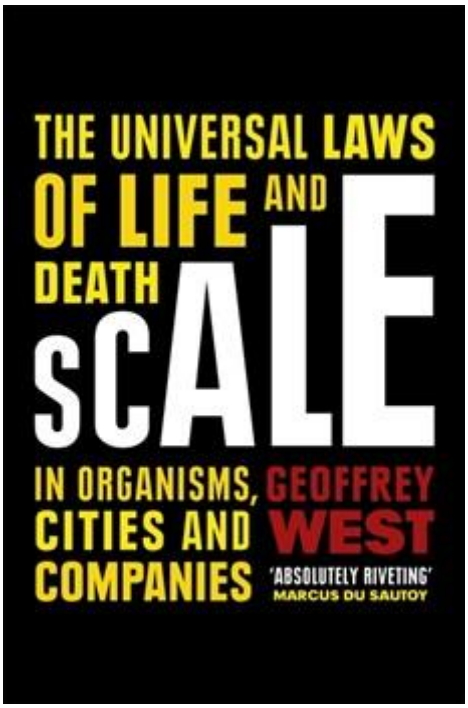
35, 7, 31, 34, 19, 21, 1

The basic ‘multi-stage’ aspect of the solution offers up a good illustration of Principle 1, but the main inventive steps seem to be more closely attributable to Principle 31 (see the cross-sectional image in the opening figure) and Principle 7, Nested Doll. The secret to the success of the design, in other words, comes down to the different sizes of the adjacent segments of the engine:




It still looks like thermoacoustics are some way away from full commercial exploitation, but this invention overcomes a major technical obstacle. Being able to operate at temperatures of less than 300degC opens up the possibility to tap into a large number of waste heat sources like internal combustion engines, heating boilers and solar cells. With a following wind, these things could make a big difference to the global energy problem.

**Best of the Month – Scale**




If 2017 is our year of ‘first principle’s, here’s a terrific contribution to the story. The new book of Geoffrey West, a theoretical physicist, comes with a mouthful of a subtitle that suggests he has unlocked the secrets of human existence — ‘Scale: The Universal Laws of Growth, Innovation, Sustainability and the Pace of Life in Organisms, Cities, Economies, and Companies’.

Spoiler alert: He hasn’t. But don’t let this dissuade you from joining him on an inspiring intellectual odyssey. One for the pattern-finders. Or rather the people that have a nose for spotting the real patterns from the myriad convenient, seductive, or self-serving ones.

Mr. West’s core argument is that the basic mathematical laws of physics governing growth in the physical world apply equally to biological, political and corporate organisms. On its face, his book’s objective is to contribute to an overarching behavioral science of what it calls ‘highly complex systems’.

But the book is also a satisfying personal and professional memoir of a distinguished scientist whose life’s work came to be preoccupied with finding ways to break down traditional boundaries between disciplines to solve the long-term global challenges of sustainability.

The central observation of ‘Scale’ is that a wide variety of complex systems respond similarly to increases in size. Mr. West demonstrates that these similarities reflect the structural nature of the networks that undergird these systems. The book identifies three core common characteristics of the hierarchal networks that deliver energy to these organisms — whether the diverse circulatory systems that power all forms of animal life or the water and electrical networks that power cities.

First, the networks are “space filling” — that is, they service the entire organism. Second, the terminal units are largely identical, whether they are the capillaries in our bodies or the

faucets and electrical outlets in our homes. Third, a kind of natural selection process operates within these networks so that they are optimized.

These shared network qualities explain why when an organism doubles in size, an astonishing range of characteristics, from food consumption to general metabolic rate, grow something less than twice as fast — they scale “sub-linearly.” What’s more, ‘Scale’ shows why the precise mathematical factor by which these efficiencies manifest themselves almost always relate to “the magic No. 4.”

Mr. West also provides an elegant explanation of why living organisms have a natural limit to growth and life span following a predictable curve, as an increasing proportion of energy consumed is required for maintenance and less is available to fuel further expansion (spoiler alert: get your S-Curve thinking hats on).

When he turns to cities, Mr. West shows that infrastructure growth scales in analogous sublinear fashion. Hence, the number of gas stations or length of roads needed when a city doubles its size reflects similar economies of scale. But relevant socioeconomic qualities actually scale super-linearly by the same factor. And while it is good news that large cities produce higher wages and more patents per inhabitant, they also generate relatively greater crime and disease. This conundrum is at the heart of Mr. West’s sustainability concerns. Theoretically, unbounded growth of cities generated by superlinear scaling “if left unchecked, potentially sow[s] the seeds of their inevitable collapse.” Unless, of course, we bring in TRIZ to help solve the conundrums. Mr West doesn’t get this part (why would he?), but this doesn’t stop the book being a great first-principle-conundrum identifier.

Despite his reliance on the analysis of huge troves of data to develop and support his theories, in the concluding chapters, Mr. West makes a compelling argument against the “arrogance and narcissism” reflected in the growing fetishization of “big data” in itself. “Data for data’s sake,” he argues, “or the mindless gathering of big data, without any conceptual framework for organizing and understanding it, may actually be bad or even dangerous.” i.e. per our PanSensic story, adding more hay to a haystack doesn’t make it any more likely we find the needles.

In presenting his own provocative and fascinating conceptual framework, Mr. West manages to deliver a lot of theory and history accessibly and entertainingly. Yet it is not clear whether that framework is robust enough to be applied productively to the business realm as he attempts to do. At least not without a healthy dose of TRIZ!

Mr. West concedes early on that the strength of mathematical correlations on which he relies decreases as he moves from the biological to the urban to the corporate. Until relatively recently, Mr. West was unable to get funding to access a database of historical corporate information. At one point during the book, he seems to blame this challenge for the particularly thin results in this domain. The problems with his analysis of the business sector, however, may be more systemic.

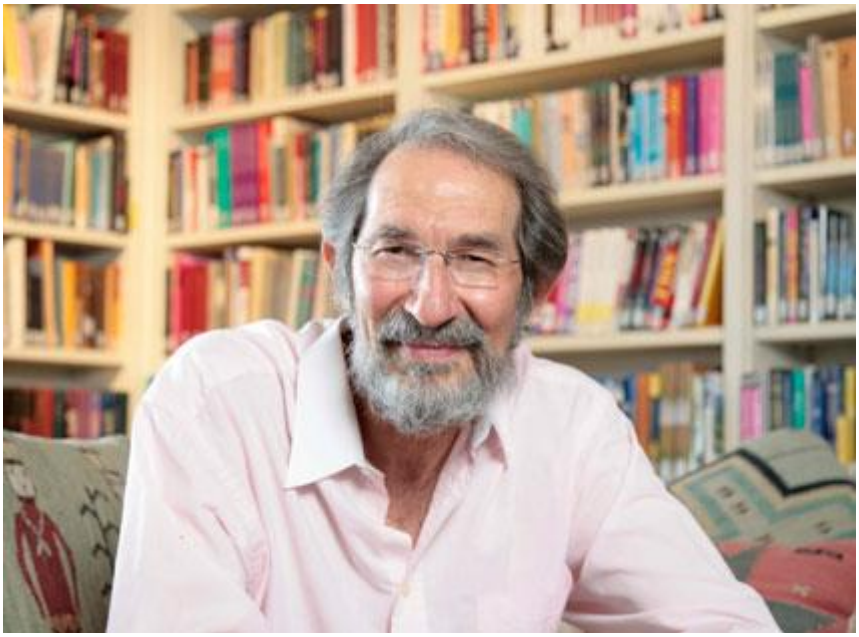
First, it is at least questionable whether the constantly shifting hierarchal network structures of corporate organizations are consistent with the three fundamental characteristics of networks upon which his framework is based. Notably, a wide range of behavioral economics research, grounded in the pioneering work of Daniel Kahneman and Amos Tversky, suggests that the optimization requirement is not likely to be met.

Furthermore, the consistent ‘decay rates of corporations identified by Mr. West — calculated by the longevity of independent public corporations over time — does not

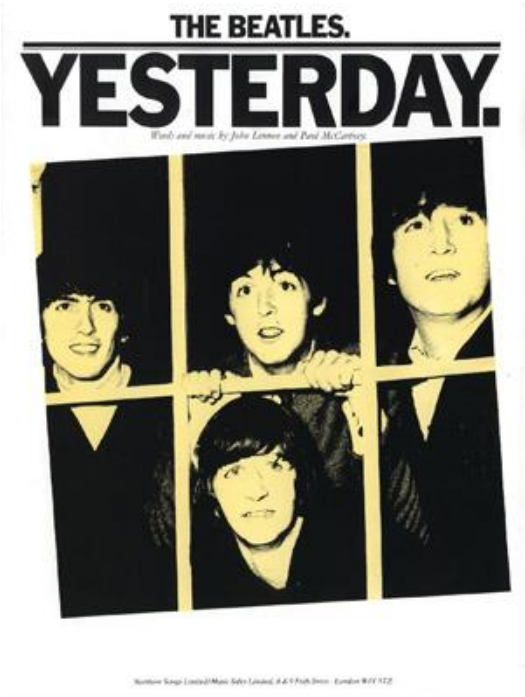
correspond to any consistent change in underlying activity analogous to “death” in living organisms. Even in the context of bankruptcy, which Mr. West looks at separately from corporate “death” from mergers and acquisitions, good businesses with bad capital structures often continue “life” under new corporate form. It is not evident how meaningful mathematical calculations could be that treat such situations the same as failed businesses that are simply liquidated in bankruptcy for scrap value. All theories are wrong, says the oft used aphorism, but some are useful. At the very least, the patterns Mr West reveals offer up a better start-point than anything else we can see in the literature. Add it to the S-Curve/contradiction solving story and we might just find a 1+1>>2 synergy. Only time will tell on that front.

Meanwhile, just because ‘Scale’ fails to realize the full promise of its title does not diminish the magnitude of its actual contribution and insight. In the 16th century, Francois Rabelais, a French scholar, admonished that “science without conscience is the ruin of the soul.”

Mr. West’s warning that big data without a theoretical framework is the ruin of science is an important contemporary corollary caution that ‘Scale’ will hopefully establish for the next generation of scholars. A great pair of shoulders to climb aboard.



**Wow In Music – Yesterday**




"I really reckon 'Yesterday' is probably my best song." This humble statement from Paul McCartney typifies what many believe to be the typical of how McCartney has behaved throughout his career. Although when asked at different times through the years what his favorite original composition was, he came up with many answers. "Your songs are like your babies, it's difficult to have a favorite," he said in 2007. "Here, There And Everywhere" has been stated regularly, although "Hey Jude," "Blackbird" and "Here Today" have been sited. He also once included "Maybe I'm Amazed" as one of his favorites, saying "that's a nice song, I like that one."

In 1980, Paul explained why "Yesterday" could be described as his best song. "I like it not only because it was a big success, but because it was one of the most instinctive songs I've ever written." Concerning the song being a "success," this understatement is evident in it being described as the most successful song in history. According to Chris Ingham's book "The Rough Guide To The Beatles," "It holds the record as the most recorded song in history, with over 2500 versions, and has been broadcast on American radio over seven million times."

As to the song being 'instinctive,' Paul's explanation of how it was written has passed into the category of legend, as we'll investigate below:

The song was written at 57 Wimpole Street, London, the family home of Richard and Margaret Asher where Paul was living while dating their daughter Jane Asher. He slept in a small attic room of the house that was rather cramped without too much extra room for anything, although there was one thing that did manage to get squeezed in. "I eventually got a piano of my own up in the top garret," remembers Paul. "Very artistic. That was the piano that I fell out of bed and got the chords to 'Yesterday' on. I dreamed it when I was staying there."

Paul vividly remembers that morning: "I woke up with a lovely tune in my head. I thought, 'That's great, I wonder what that is?' There was an upright piano next to me, to the right of

the bed by the window. I got out of bed, sat at the piano, found G, found F sharp minor 7th – and that leads you through then to B to E minor, and finally back to E. It all leads forward logically. I liked the melody a lot but because I'd dreamed it I couldn't believe I'd written it. I thought, 'No, I've never written like this before.' But I had the tune, which was the most magic thing. And you have to ask yourself, 'Where did it come from?' But you don't ask yourself too much or it might go away…There are certain times when you get the essence, it's all there. It's like an egg being laid – not a crack or flaw in it."

Speaking of eggs, so that his memory of the melody wouldn't "go away," he wrote some simple words to go along with the phrasing of the melody line. "It had no words. I used to call it 'Scrambled Eggs.' The lyrics used to go, 'Scrambled eggs, oh, my baby, how I love your legs…' There was generally a laugh at that point - you didn't need to do any more lyrics."

Since we know where the melody was first conceived, many wonder when exactly this morning occurred. Barry Miles, co-author of Paul McCartney's book "Many Years From Now," explains this morning as having occurred in May of 1965. While this seems to be the final word, there is evidence to suggest an earlier date. "The song was around for months and months before we finally completed it," recalls John Lennon. He continues: "Paul wrote nearly all of it, but we just couldn't find the right title. Every time we got together to write songs or for a recording session, this would come up. We called it 'Scrambled Eggs' and it became a joke between us. We almost had it finished when we made up our minds that only a one-word title would suit and, believe me, we just couldn't find the right one. Then, one morning, Paul woke up, and the song and the title were both there. Completed! I know it sound like a fairy tale, but it is the plain truth. I was sorry, in a way, because we had so many laughs about it."

June 14th, 1965 turned out to be 'Paul McCartney' day in the recording studio. The Beatles were in EMI Studio Two from 2:30 to 5:30 pm recording two Paul songs in their entirety, namely "I've Just Seen A Face" and the rock'n'roll screamer "I'm Down." After an hour-and-a-half break, they returned at 7 pm for another three hour session, the only recording accomplished during this session being two takes of "Yesterday" by only Paul on acoustic guitar and vocals.

"I brought the song into the studio for the first time and played it on the guitar," Paul remembers, "but soon Ringo said, 'I can't really put any drums on – it wouldn't make sense.' And John and George said, 'There's no point in having another guitar.' So George Martin suggested, 'Why don't you just try it by yourself and see how it works?' I looked at all the others: 'Oops. You mean a solo record?' They said, 'Yeah, it doesn't matter, there's nothing we can add to it – do it.'"

The first take is interesting because of the somewhat lackadaisical approach Paul had in its' recording. His awkward rhythmic chording in the introduction was dropped after the first few measures, replaced by what we're used to hearing in the final product. He transposes two lines in the second verse, namely "there's a shadow hanging over me" and "I'm not half the man I used to be." Realizing he had done this, a slight chuckle can be detected. Also, he ends the first bridge with descending notes ("long for yesterday-ay-ay-ay") and, when he gets to the second bridge, reluctantly repeats the process with a hesitancy that suggests he knows he shouldn't do it both times. This take is a little rough but still beautifully performed.

Now that he had gotten his bearings, the second attempt is done far more professionally. The straightforward rhythmic chording appears right from the beginning, he sings the lines

correctly in the second verse, and he holds out the last syllable of the word “yesterday” at the end of the first bridge, saving the descending notes for the second bridge. Two takes was all that was needed.

The next point of business for the rest of the evening session that day was what else could be done to the song. George Martin recalls how Paul “sat on a high stool with his acoustic guitar and sang ‘Yesterday.’ That was the master to begin with. Then I said, ‘Well, what can we do with it?’” Several different approaches were suggested and possibly tried out, reportedly even adding John on organ. George Martin then told Paul, “’The only thing I can think of is adding strings, but I know what you think about that.’ And Paul said, ‘I don’t want Mantovani.’ I said, ‘What about a very small number of string players, a quartet?’ (Principle 5) He thought that was interesting.”

Paul begs to differ. “George Martin had the idea to put the string quartet on it and I said, ‘No, I don’t think so.’ He said, ‘I’ve really got a feeling for it. I can hear it working.’ I said, ‘’Are you kidding? This is a rock group!’ I hated the idea…But he cleverly said, ‘Let’s try it,’ and I thought, that’s fair enough. ‘If we hate it,’ he said, ‘we can take it off. We’ll just go back; it’s very nice just with the solo guitar and your voice…Look, why don’t you come ‘round to my house tomorrow? I’ve got a piano, and I’ve got the manuscript paper. We’ll sit down for an hour or so, and you can let me know what you’re looking for.” With that decided, the recording session was over for the night.

The next day, June 15th, 1965, Paul met up with George Martin at his house as suggested. As Paul remembers: “We’d sit down and it would be quite straightforward because I’d have a good idea of how I wanted to voice it. Or George would show me possibilities: very wide apart or very gungy and very close, and we’d choose. He would say, ‘This is the way to do the harmony, technically.’ And I’d often try to go against that. I’d think, ‘Well, why should there be a proper way to do it?’”

“There was just one point in it where I said, ‘Could the cello now play a slightly bluesy thing, out of the genre, out of keeping with the rest of the voicing?’ George said, ‘Bach certainly wouldn’t have done that, Paul, ha ha ha.’ I said, ‘Great!’ That was what we often used to do, try and claim our one little moment. I mean, obviously it was my song, my chords, my everything really, but because the voicing now had become Bach’s, I needed something of mine again to redress the balance. So, I put a (Principle 17) 7th in, which was unheard-of. It’s what we used to call a blue note, and that became a little bit well known. It’s one of the unusual things in that arrangement.”

Concerning this “blue note,” which is heard after the words “she wouldn’t say” in the second bridge, George Martin comments: “John listened to (the finished song), and there’s a particular bit where the cello moves into a bluesy note which he thought was terrific, so it was applauded.”

On June 17th, 1965, a 2 to 4 pm recording session was held in EMI Studio Two to record the string quartet overdub to Paul’s acoustic performance of “Yesterday.” Paul also had some say in how these musicians were to play. George Martin remembers: “He insisted, ‘No vibrato, I don’t want any vibrato!’ If you’re a good violin player it’s very difficult to play without vibrato. Paul told the musicians he wanted it pure. But although they did cut down the vibrato they couldn’t do it pure because they would have sounded like schoolboys. I think Paul realized in later years that what he got was right.”

One last overdub needed to be added, and this was to (Principle 5) double-track Paul’s vocals at the end of the first bridge in order to extent his final high note on “yester-

dayyyyyyy." The double-tracking begins on the words "something wrong" and then completes the bridge.

There are four other, perhaps more discrete, 'wow's on the song:

1) The song has two contrasting sections (Principle 3), differing in melody and rhythm, producing a sense of disjunction:

The first section ("Yesterday, all my troubles seemed so far away ...") opens with an F chord (the 3rd of the chord is omitted), then moving to $Em_7$ before proceeding to $A_7$ and then to D-minor. In this sense, the opening chord is a decoy (Principle17) ; as musicologist Alan Pollack points out, the home key (F-major) has little time to establish itself before "heading towards the relative D-minor." He points out that this diversion is a compositional device commonly used by Lennon and McCartney, which he describes as "delayed gratification".

The second section ("Why she had to go I don't know ...") is, according to Pollack, less musically surprising on paper than it sounds. Starting with $Em_7$, the harmonic progression quickly moves through the A-major, D-minor, and (closer to F-major) B♭, before resolving back to F-major, and at the end of this, McCartney holds F while the strings descend to resolve to the home key to introduce the restatement of the first section, before a brief hummed closing phrase.

Pollack described the scoring as "truly inspired", citing it as an example of "[Lennon & McCartney's] flair for creating (Principle 5) stylistic hybrids"; in particular, he praises the "ironic tension drawn between the schmaltzy content of what is played by the quartet and the restrained, spare nature of the medium in which it is played."

The tonic key of the song is F major (although, since McCartney tuned his guitar down a whole step, he was playing the chords as if it were in G), where the song begins before veering off into the key of D minor. It is this frequent use of the minor, and the ii-V7 chord progression (Em and $A_7$ chords in this case) leading into it, that gives the song its melancholy aura. The $A_7$ chord is an example of a secondary dominant, specifically a V/vi chord. The $G_7$ chord in the bridge is another secondary dominant, in this case a V/V chord, but rather than resolve it to the expected chord, as with the $A_7$ to Dm in the verse, McCartney instead follows it with the IV chord, a B♭. This motion creates a descending chromatic line of C–B–B♭–A to accompany the title lyric.

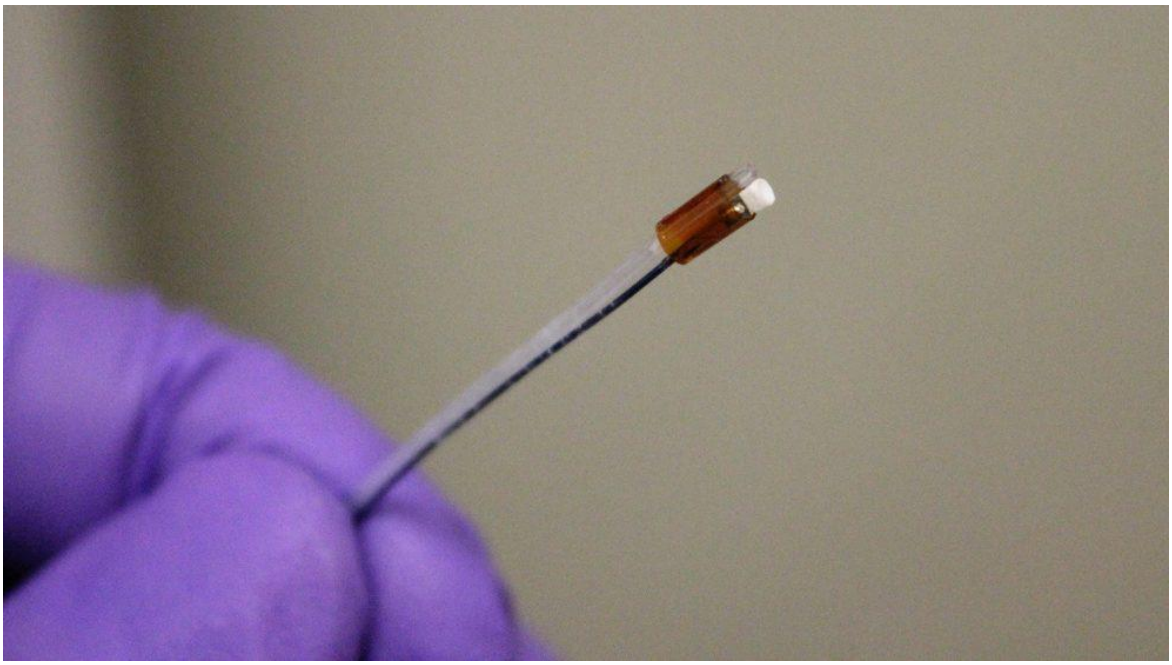
2) The verse is an unusual (Principle 16) seven measures long but, because of the rhythmic phrasing, it doesn't come across as awkward at all. The thumping bass notes of Paul's guitar work are deliberate in their strategic placements, showing that he was well rehearsed beforehand. He even fits the final word with a planned (Principle 2) syncopated beat ("yes-ter-day") that breaks the rhythmic pattern found in the rest of the verse. The overall effect, lyrically and musically, is stunning – a vivid depiction of absolute loneliness as a result of an illusionary romance.

Coincidentally (or maybe not), the second seven-measure verse begins with the word "suddenly" just as we suddenly hear the string quartet arrive to add a deeper sense of heartache to the already dour landscape (a different kind of Principle 5). The instrumentalists stay relatively within the parameters of the chords with one notable exception (Principle 3) being the subtle melody line that dances as a harmony with Paul's lyric "yesterday came suddenly."

3) Some of the songs lyrics are statements of yearning for the past (“all my troubles seemed so far away,” “I’m not half the man I used to be”), while others are based in the present (“Now it looks as though they’re here to stay”). The past yearnings lines all follow ascending melody lines, whereas the ones in the present all follow descending melodies. Hello, again, Principle 3.

4) Finally, during the repeated third verse, the quartet pulls out all the stops (Principle 38). A violin holds a single high note for the first five measures and the viola joins in midway through the third measure to begin a subtle lower harmony to Paul’s vocal melody. A repeat of the final two measures acts as a conclusion for the song although Paul chooses to hum instead of sing (Principle 2). He also dispenses with the thumping bass notes (Principle 2) and sticks to a few higher strings played in a falling pattern. The quartet follows him down and then punctuates the final two notes as it then fades away. History is made!

**Investments – Ultrasound ‘Drill’**



‘Ultrasound can do anything’ part #455. One of my small paranoia’s in life is the potentially lethal effects of something as simple as a blood-clot. For almost as long, I’ve assumed that ultrasound ought to be a way to non-invasively break-up clots. But then, every time I do a search on the subject, it always comes back with the fact that while ultrasound can be used to detect clots, there’s nothing on actually using the ultrasound energy to go the next step. Until now…

Researchers at North Carolina State University and the University of North Carolina at Chapel Hill have developed a new surgical tool that uses low-frequency intravascular ultrasound to break down blood clots that cause deep vein thrombosis. The tool is the first ultrasound "drill" that can be aimed straight ahead, allowing doctors to better target clots -- which holds promise for significantly reducing treatment time. To date, the technology has been tested only in synthetic blood vessels.

Existing intravascular ultrasound tools for clearing clots emit ultrasound waves laterally. This makes it harder to target clots exclusively, meaning that the ultrasound can also damage surrounding blood vessels. However, ultrasound breaks the clots into very small pieces, so doctors don't need to use large doses of blood thinner to dissolve the clot remnants.

Another technique uses a diamond-tipped drill to effectively chew through clots. This is more targeted, posing less risk to blood vessels. However, this technique breaks the clot into relatively large pieces, requiring higher doses of blood-thinning drugs – which can pose risks of their own.

"Our new ultrasound tool is forward-facing, like a drill, but still breaks down clots into very fine particles," says Xiaoning Jiang, a professor of mechanical and aerospace engineering at NC State and corresponding author of a paper describing the work. "Our approach improves accuracy without relying on high doses of blood thinners, which we hope will reduce risks across the board."

The tool also incorporates an injection tube that allows users to inject microbubbles at the site of the clot, making the ultrasound waves more effective at breaking down the clot. The researchers tested a prototype of the device in a synthetic blood vessel using cow's blood.

"We found that we could dissolve 90 percent of a clot in 3.5 to 4 hours without using any blood thinners at all," says Jinwook Kim, lead author of the paper and a Ph.D. student in Jiang's lab. "That's compared to 10 hours for the combination of conventional ultrasound tools and blood thinners."

"This is a successful proof of concept, and we're now in the process of securing funding to move forward with trials in an animal model," Jiang says.

The researchers have filed a patent on the technology and are interested in working with industry partners to help develop the device. The application isn't yet published so it isn't possible to say with certainty, but looking at the photo, I'd say there was a mass of untapped Evolution Potential to be had… not least of which would be to combine the 'drill' with the detection need. Watch this space.

Read More:

Jinwook Kim, Brooks D. Lindsey, Wei-Yi Chang, Xuming Dai, Joseph M. Stavas, Paul A. Dayton, Xiaoning Jiang. Intravascular forward-looking ultrasound transducers for microbubble-mediated sonothrombolysis. Scientific Reports, 2017; 7 (1) DOI: 10.1038/s41598-017-03492-4

**Generational Cycles – Beyond The 'Pseudo-Science'**

Time, this month, to have a deeper look at the 'pseudo-science' arguing article mentioned in last month's Generation article. We love anything that challenges existing theories. But only if it adds something to the story, as opposed to merely taking shots because the message being communicated by the theory is somehow inconvenient, or against your own views of the world. As we'll see, we tend to get more of the latter than the former in the article in question. Perhaps in no small part because Steve Bannon is a 'fan' of the Strauss & Howe Generations story, and who doesn't like taking a jab at him? That aside, let's have a look at the diatribe section by section:

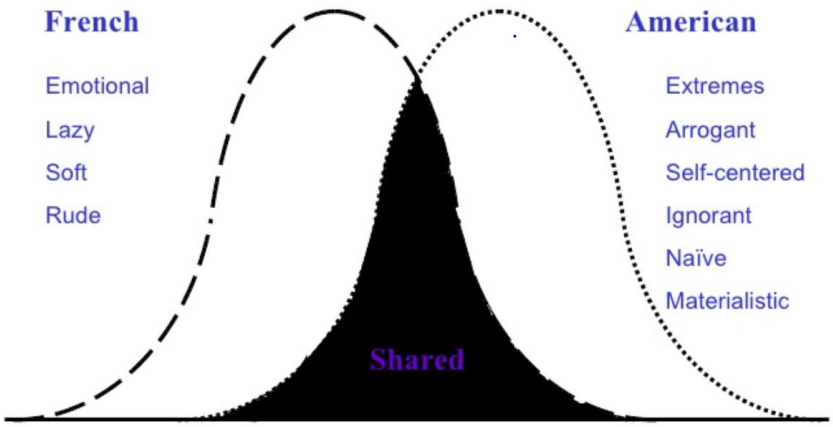
*What Strauss and Howe added in their work was a comprehensive theory of generational repetition: US history moves in 80-year cycles, with generations moving through 20-year periods of influence called turnings. The cycles have highs and lows interspersed with major crises in history like the American revolution, the Civil War, and World War II. Each of the four generations embody fundamental characteristics, and these characteristics repeat themselves throughout history. Our current cycle calls for a major, defining crisis that will take place, well, any moment now.*

The Theory says nothing about '80-year' or '20-year' periods, 'repeating throughout history' or 'calling for a major, defining crisis', never mind, 'any moment now'. The DNA of the model is clear: 'the manner in which your parents raised you will influence the way you raise your own'. Likewise, it is clear that global events will and do happen at random. What drives societal behaviours are the reactions to these events. Sometimes the random events that 'happen' to cause society to react in large numbers come 'early' and sometimes they come 'late'. That's why the actual cycle time is somewhat variable between 80 and 100 years, and why some turnings occur before the '20 years' is up and some occur after. This variation currently tells us that the likely 'defining crisis' – the one that will create the societal s-curve shift will most likely occur somewhere during the period 2020 to 2025, and not 'any moment now'.

*"Social/demographic historians would agree that one can distinguish 'generations'… but would be skeptical of ideas like cycles or radical disjunctures or character types," says Claude Fischer, a*

*professor of sociology at the University of California, Berkeley, who noted that the variation between generations is distinctive "in only a statistical sense, usually percentage points different one way or another."*

This is one of the more serious errors in thinking not just in the article, but also in the manner many people think. In any complex environment, there will be some kind of distribution of characteristics. When we hear someone generalize about the French, or Americans, we (should) know that the speaker is not trying to imply that 100% of French people are rude or 100% of Americans arrogant, but rather that if you had a room full of French and Americans, on average you'd be likely to observe that the French were 'ruder' than the Americans, and, on average, the Americans more arrogant than the French:




In exactly the same way, not every Millennial is 'heroic', nor is every GenX Nomad 'alienated'. There's a distribution. One where we are likely to see that 'on average' the Millennials will have more Heroic attributes than the Nomads.

While the shift in average may indeed only be 'percentage points', that completely misses the point as far as the manner in which we and TrenDNA uses the difference. The key thing at stake here is to establish the contradictions that in turn lead to the innovation opportunities. Using the theory has nothing at all to do with the percentage of heroes and nomads, simply that if we can design a new offering to solve the contradiction *between the two extremes*, we make everyone else in between happy… and if we don't, that's merely because we've selected the wrong extremes.

*According to their theory of generational repetition, millennials will be a "heroic" generation, the modern analogues of the Greatest or GI Generation that came of age during World War II. Approximately 80 years later, millennials are destined to face a similar political and economic crisis, inherited from the poor management of their progenitors. No doubt the writers also enjoyed the parallels between their new generation, which looks forward to an epoch defining crisis, and the original Christian millenarianist movements, which looked forward to the end of the world.*

The third sentence is the one that betrays the dishonesty of the article. Attempts to make comparison with thoroughly discredited ideas that were based on no Theory at all is grossly unfair.

*Sociologists do recognize a "distinctive consciousness" that can be used to identify a generation's worldview, centered on an influential historical event that occurred during their youth. For example, the mass mobilization in World War II and the experience of the Great Depression are believed to have left lasting marks on members of the GI generation. But saying that generations can share an identity is very different than saying they share a destiny.*



SYSTEM ATIC INNOVAT ION

There's again absolutely nothing in the theory about 'shared destiny'. Some things in the world change monotonically and some don't. Technologies tend to be monotonic – mobility or communications, for example, almost never go through periods of 'getting worse'. At some points in history they improve faster than others, but overall the direction is consistently and reliably towards improvement. Then there are things in life that are non-monotonic. Things that oscillate. Sometimes we crave nostalgia and sometimes we don't. Sometimes society over-protects its infants and sometimes it under-protects them. Strauss & Howe's model is purely about the latter oscillatory patterns. It tells us that the identities of Heroes in the GI Generation and the Millennials are similar in many ways because they were both generally protected as children, but it tells us nothing about their destiny. Yes, they will tend to have to face a Fourth Turning crisis in their adult years, but no-one is saying they can predict what the crisis will be, or what the outcome will be. Simply that times of chaotic crisis are rarely sustainable for long periods of time. Complex adaptive systems theory tells us that. Nothing to do with Strauss or Howe.

*Most generational labels are applied after the fact—"Generation X" didn't have a name until 1991, when the oldest members were already 26.*

So what? 'Show me the child of seven and I'll show you the man', Shakespeare famously said. What he didn't say was that you could see the man from the newborn baby. The naming of Generations is a classic example of 'events happening at random, but societies reaction to the events is generationally conditioned. As a species we seem to universally love categorizing things, and especially societal tribes. Consequently, multiple authors and commentators try to create labels that fit. Only society at large, however, can choose to adopt or reject those labels. It just happened that when author Douglas Coupland penned the book Generation X, there was a general nodding of heads (in the West at least), and the start of a meme that both the Nomad generation and the generations around them recognized as something that 'felt right'. The dozens of authors before and after Coupland saw their naming attempts fail because, for whatever reason, society deemed they weren't 'right'.

*Thanks to Strauss and Howe, however, millennials have had to grow up with their label, actively trying to justify, or deny, an identity based on a crisis that had yet to occur. What could it be? Strauss and Howe have been trying to find a "Fourth Turning" to define the generation for some time now. (Previous turnings featured the American Revolution, World War II, and the Great Depression.) Just like financiers predicting hyper-inflation in the US, they are quite sure the event is always just around the corner.*

In the same way that firefighters light fires, pattern-finders find patterns. Most of these patterns prove to be the result of some form of cognitive bias. The whole point of the Strauss & Howe theory is not to try and find – or worse, 'engineer' – crises that fit the model, but to try and find things that don't fit. That's exactly what we've been trying to do in our research over the last two decades. The fact that we haven't found contrary evidence is the reason we still talk about the Theory. From a personal perspective, I couldn't be happier if there was no crisis in the next ten years. Talking about crises doesn't create crises. As far as Strauss & Howe are/were concerned, their work revealed a model for the first time that, now we know it, it should have allowed humanity to *knowingly avoid* the next crisis period. It appears that message hasn't been listened to. Ironically, if Strauss & Howe – both 'moralistic' Boomers – had have properly understood their own theory, they would have understood that being moralistic was no way to convince the other generations about the validity or otherwise of their theory.

*Perhaps the defining experience of the millennial generation is relative economic stagnation and inequality. But even that oft-heard word, inequality, is a reminder of how heterogenous millennials are: The experience of a college-educated 25-year-old is very different from one with a high-school education. Not surprisingly, this most racially diverse of American cohorts is likely to have the most diversity of experiences.*

This seems to me to betray a fundamental mis-understanding about the difference between patterns and absolutes. Yes, of course, Millennials are more heterogenous than previous generations. That's because the Internet means it's very easy to see a broad spectrum of things that were very difficult for previous generations to see. The point here is not that every Millennial Facebook page is different to every other one, but that, when we step back and look for meta-patterns we realise there is a preponderance of narcissism, of wanting to portray yourself as someone better than your real self, of wanting to make a difference to the world, and, generally, to behave 'heroically'. If I like socializing, a Hero says, I will socialize heroically in exactly the same way that if I wish to be abstemious, I will do that heroically too. Heterogenous and homogenous: just at different viewing perspectives.

*The millennial cannot be falsified*
*The malleability of Strauss and Howe's predictions says a good deal about the logic of these theories: The millennial generation is heroic because it will face the cataclysm of a Fourth Turning, and the Fourth Turning will be a cataclysm because it comes about 80 years after the last one. There's more faith than reason at work here.*

This is the part where the article is at its dumbest. The whole point of any theory is that it allows us to make predictions that, if they come true help to preserve the theory, and if they don't cause us to reflect and revise the theory. When the Fourth Turning book says things like, 'we can't predict what it will be specifically, but if the theory is true we should expect to see a societal event somewhere in the period 2000 to 2005 that will change the mood of American society', that was very specifically putting their necks on the line.

Again, all theories are wrong, but some are useful. If an organization is trying to project what they should be doing in 2035, or 2040, is it better to use a theory, or to randomly dream crap up? This is where I get very frustrated with individuals that demand I 'prove' the model before they'll do anything with it. Prove it relative to what? If they had something better they were using, I'd go along with the argument; when I realise – as I invariably do – that they're poking around in the dark with no clue about anything, that's when I realise they're a hopeless cause.

*Most scientists don't use the terms 'boomer,' 'ex-er,' and I don't as well," Glen Elder, a University of North Carolina sociologist who is a pioneer in the field of life cycle studies, wrote in an e-mail. He makes a distinction between "generations" and "birth cohort." Birth cohorts "locate people in history," while "generations are used to refer to a population born in a historical era, they generally cover a broad span of time—in doing so, they lose precision regarding historical influences."*

Great that Glen Elder saw fit to 'write an email' challenging the theory and make a tedious semantic point about the difference between 'generation' and 'birth cohort', but look at his list of publications (which I've done by the way), and you realise that this is a 'scientist' with really no clue at all about life-cycle studies. Simple tests: a) does he understand s-curves and discontinuous change? Answer: No. b) does he understand emergence and resolution of Contradictions? Answer: No. c) does he understand anything about complex adaptive systems? Answer: No. Three strikes, Mr Elder and you're out. Bye bye.

*Elder illustrates the challenges in assuming a homogenous view of generations by citing research into the Greatest Generation that helped define the field. He tracked individuals born in California over 40 years in order to assess how the Great Depression affected them. The results show major differences within fairly small time spans: Children born in 1920 or 1921 and those born seven or eight years later had very different experiences, as did boys and girls. In contrast, Strauss and Howe consider the entire group to be part of the same "GI" generation.*

This is the same as the previous absolute-versus-distribution argument. We know that there are subtle differences in the turning points in the Strauss & Howe theory. Females tend to mature faster than males. Urban dwellers tend to see trends before those in rural areas. Popular music, for example, appears to follow half-generation patterns. As does fashion. This doesn't nor shouldn't discredit the theory: the theory is there to help us to find contradictions not question whether New Yorkers are seven months or nine ahead of Parisians.

*Social scientists have hunted for "age changes that are universal or nearly universal across time and place," akin to what Strauss and Howe describe. Discovering some universal rhythm to history would revolutionize our understanding of human society. But researchers consistently find more difference than similarity, between and among generations.*

Crucially, as far as TrenDNA is concerned, Generation theory is but one of three important DNA-strands that help determine societal patterns and find the best contradictions to solve. We also need to look at Gravesian Thinking Styles and Cultural differences. It's not possible to look at any one in isolation from the other two if you hope to draw any meaningful conclusions. A Heroic 'Order' thinker is different in many ways from a Heroic 'Feudalist', but they are both Heroic.

*To borrow a phrase, they argue that time is a flat circle.*

At no point in Struass & Howe's work do they imply such an image or draw such a graphic. Some things in life change monotonically and some are cyclical. Taken together this should tell us that rather than a 'flat circle', a far more representative model of the world would have a spiral shape.

*A self-fulfilling prophecy?*
*"[Millennials] have been the most written about generation of any generation, in terms of media and culture and their impact," Tucker, the Ogilvy president, says. In his view, however, all this attention hasn't resulted in the empowerment, energy or heroism predicted by the generational theorists. Instead, he says it made them anxious—which is supposed to be Gen X's problem. Ogilvy hired psychoanalysts and ethnographic researchers in an effort to understand young people and the perception that millennials seek an "amazing set of life experiences." However, their researchers found that millennials' search was "fueled by high degrees of anxiety and a bit of insecurity…because they've grown up with social media, they feel high degrees of pressure to compete against their peers."*

More nonsense. There is no 'self-fulfilling prophecy'. The current Generation model is a description of first principle behaviours that, so long as they remain in place, will tend to cause societal patterns to emerge in similar ways. If the Millennial generation rejects the heroic label, they won't be heroic (and will find other common ground instead). If the Millennials read the word 'Hero' and empathise with it, they will tend to emerge in the direction of heroic. We like what we like. We aspire to the things we aspire to. If a person has been protected in childhood and told they can 'be whatever they want to be' when they grow up, that's the way they will tend to see the world. Especially if their (alienated,

over-protecting) parents always step-in to help when the going gets tough. With the Hero generation, this tends to be more the case than not.

*As the sociologist Elder and a co-author, Linda George of Duke University, write, "cohort differences are only one window to the life course—and how it changes over time. In many ways, cohort analysis provides a view of the 'forest' of life course patterns; but it is intra-cohort variability that allows us to see the 'trees.'"*

Every tree is different, and so is every forest. But both carry similarities. I have three 150-year-old beech trees in my garden and all three look different. At the same time, whether I step back and look at the whole tree, or zoom-in close and look at a single leaf, I can tell it's a beech and not an oak or chestnut.

And yet again – likely not for the last time – the job of the theory is not to pigeon-hole everyone, it's to look for differences so we can define the contradictions that in turn allow us to solve them and improve the lot of everyone. It's not about making beech trees happy at the expense of oaks, it's about creating an environment in which all the trees get what they want and need, when and how they need it.

Finally, here's another set of complex adaptive system relevant 'first principle' patterns:

| Science | Pseudoscience |
|---|---|
| Willingness to change with new evidence | Fixed ideas |
| Ruthless peer review | No peer review |
| Takes account of all new discoveries | Selects only favourable discoveries |
| Invites criticism | Sees criticism as conspiracy |
| Verifiable results | Non-repeatable results |
| Limits claims of usefulness | Claims of widespread usefulness |
| Accurate measurement | "Ball-park" measurement |

Don't get me started on 'peer review'. If the Elder argument is in any way 'ruthless' it is in its attempt to obscure truth and confirm Elder's own biases. Academics: a profession on the edge of extinction. If they're not careful. Irrespective of generation cohort.

**Biology – Fox Squirrel**

Fox squirrels are a lot more organized than we thought—storing their stashes of nuts by variety, quality, and possibly even by preference.

A new study is the first to show evidence that squirrels arrange their bounty—at least 3,000 to 10,000 nuts a year—using “chunking,” a cognitive strategy in which people and other animals organize spatial, linguistic, numeric, or other information into smaller more manageable collections, such as subfolders on a computer.

“This is the first demonstration of chunking in a scatter-hoarding animal, and also suggests that squirrels use flexible strategies to store food depending on how they acquire food,” says Mikel Delgado, a postdoctoral researcher at the University of California, Berkeley, and lead author of the study in Royal Society Open Science.

Presumably, sophisticated caching techniques maximize the squirrels’ ability to remember where they’ve stored their most prized treats while at the same time hiding them from potential pilferers.

“Squirrels may use chunking the same way you put away your groceries,” says senior author Lucia Jacobs, a professor of psychology.

“You might put fruit on one shelf and vegetables on another. Then, when you’re looking for an onion, you only have to look in one place, not every shelf in the kitchen.”

Over a two-year period, the research team tracked the caching patterns of 45 male and female fox squirrels as the reddish gray, bushy-tailed rodents buried almonds, pecans, hazelnuts, and walnuts in various wooded locations.

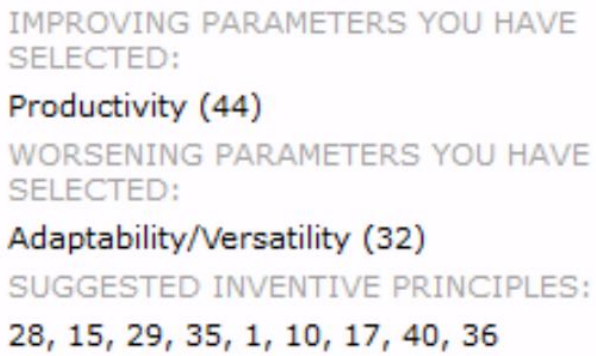
The study used combinations of locations and nut sequences on various groups of fox squirrels. In one experiment, for example, each of the squirrels were fed 16 nuts, one after another, under two separate conditions: Some were fed at the locale where they had cached the previous nut fed to them while others were fed at one central location, to which they would need to return if they wanted another nut.

Some squirrels were given 16 nuts in rows of four, say, almonds followed by pecans, followed by hazelnuts, and then walnuts, while others received 16 nuts in random order. Researchers used hand-held GPS navigators to track the squirrels from their starting location to their caching location, then mapped the distribution of nut types and caching locations to detect patterns.

Squirrels who foraged at a single location frequently organized their caches by nut species, returning to, say, the almond area, if that was the type of nut they were gathering, and keeping each category of nut that they buried separate. Meanwhile, the squirrels foraging in multiple locations deliberately avoided caching in areas where they had already buried nuts, rather than organizing nuts by type.

“These observations suggest that when lacking the cognitive anchor of a central food source, fox squirrels utilize a different and perhaps simpler heuristic (problem-solving approach) to simply avoid the areas where they had previously cached,” the authors write.

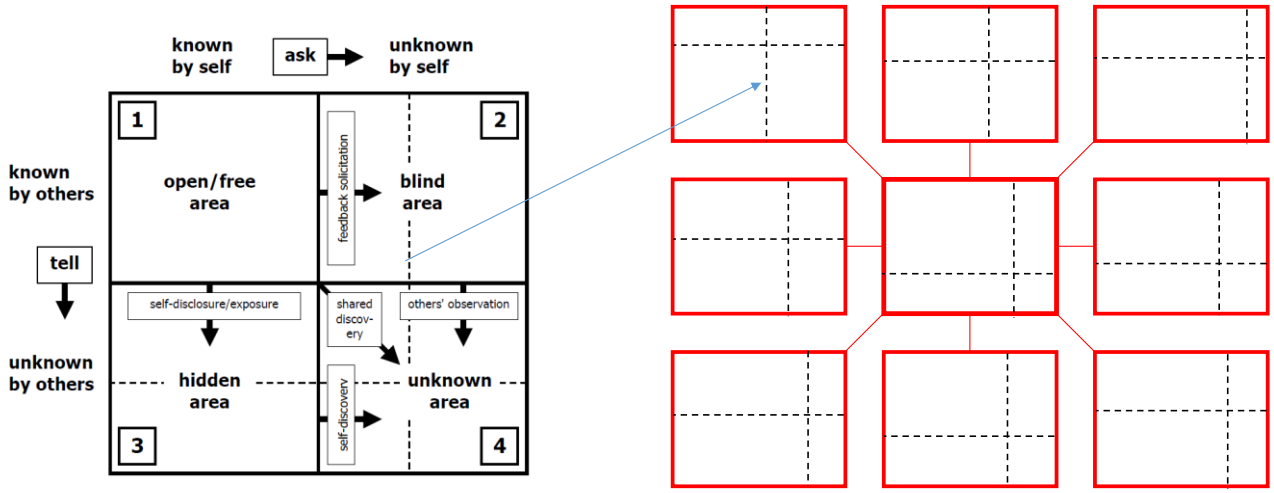
And from a TRIZ, Conflict-solving perspective, the fox squirrel problem looks something like this:




And there’s the ‘chunking’ solution – Principle 1 – in fifth place.

## Short Thort

*"If I finish a book a week, I will read only a few thousand books in my lifetime, about a tenth of a percent of the contents of the greatest libraries of our time. The trick is to know which books to read."*
Carl Sagan, Cosmos




"9 (Johari) Windows"… adding structure to the search

## News

### Network Rail Innovation Conference

Darrell will be giving a keynote presentation and there will be SI and PanSensic trade stands at the UK's big rail sector innovation event of 2017. 10 November is the date, and Network Rail HQ in Milton Keynes the location.

### Design Creativity Conference

Darrell will be giving a key note talk at the Design Creativity conference in Bath. The conference takes place over the period 31st January to 2nd February 2018. Darrell's session will be on the Friday afternoon. More details at http://www.icdc2018.org.uk/

### Online Certification Programme

Following the big success of the IMechE-run '21st Century TRIZ webinar last month, it looks like now may just be the right time to schedule a longer on-line Certification programme. We already have the bulk of the sections of the programme videoed so participants can watch them at their own pace, and we're just about finished with the strategy for allowing for assignments and assignment marking. Which then just leaves the small job of scheduling a sequence of live webinar sessions so we can create a solution that is properly multi-directional, rather than us just being on transmit the whole time. The current plan is to launch the full offering, via the SI on-line shop, from February 2018. The sign-up page should be live in the next couple of weeks for anyone interested in taking advantage of the 'early-bird' sign up pricing.

**Buckingham MSc**
Everything is on track for the formal commencement of the new Structured Innovation Masters programme. The first Module is confirmed for the week 22-26 January. The session will be convened at the University. More details from the Programme website, and – coming soon – via endorsement from the UK Government Department of Trade & Industry. We're looking to get 16 people enrolled in the first cohort and are currently three-quarters of the way there… there are still places, but don't hold back for too long if you want to guarantee a place.

**New Projects**
This month's new projects from around the Network:

- Logistics – SI Certification Workshop
- Consumer Electronics – SI Certification Workshops
- Government – PanSensic Project
- Semiconductor – Domain Mapping & IP Creation Project
- Education – Leadership & Complexity Workshops
- ICT – SI workshops
- ICT – Innovation Coaching & Mentoring Programme
- Government – Innovation Culture Programme
- Food & Agriculture – Strategic Innovation Project
- Consumer Goods – Patent Invent-Beyond Project