

Systematic Innovation



e-zine

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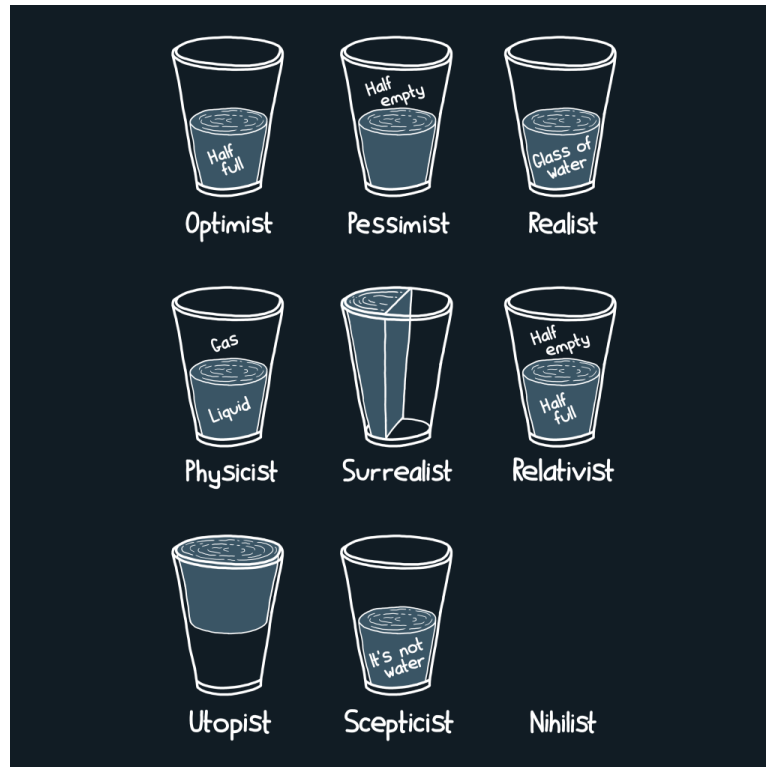
News

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Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.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

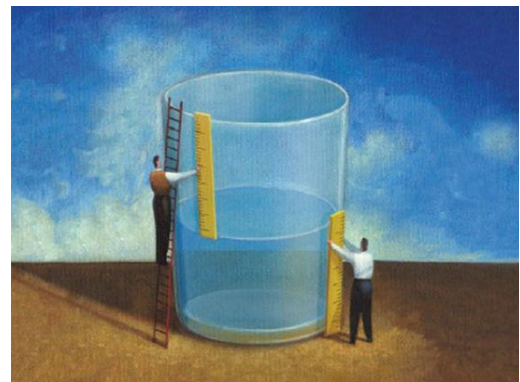
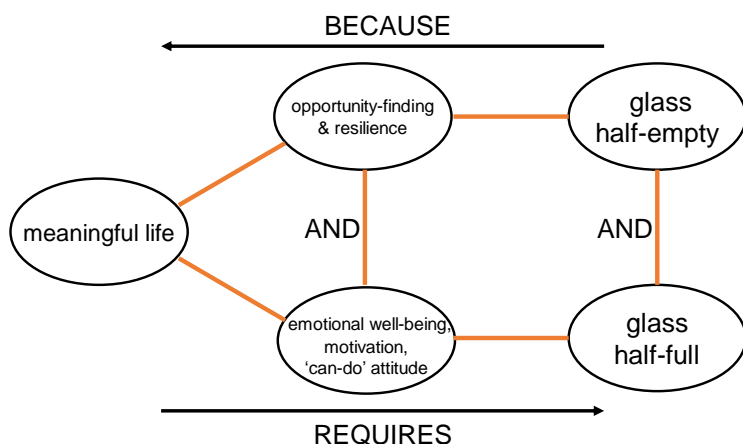
Glass Half-Full *And* Half Empty



After a while it can get quite wearing. Either-or questions. Are you a glass-half-full person or a glass half empty person? Yes.

It depends. Right? But for some reason we love to put people in pigeon-holes. Anyone that only sees me at work is likely to think of me as Mr Half-Empty. Ditto anyone that I see only when I go watch my football team play. Anyone that I only see at gigs, on the other hand, would probably describe me as the opposite. I'm both people, but which one I might be at a given moment in time depends on the context of that moment. If I'm in a problem-solving session and focusing on conflicts and contradictions, almost by necessity I'm forced to look at the world with a glass-half-empty perspective. Wearing rose-tinted glasses is not a good way to find innovation opportunities.

Being half-full *and* half-empty means solving a physical contradiction. The general situation looks something like this:



More often than not, solving physical contradictions means using some kind of separation strategy. I could solve the contradiction spatially by being upbeat and smiley while stood listening to the band and I can be downbeat and grouchy while stood in a workshop in France with a group of reluctant French problem-solvers in front of me. I could also say this is an example of separation in time since it will be difficult to be at the concert hall and at the workshop at the same time.

Space and time are always valid separation strategies to explore, but when it comes to the psychology of my relative state of optimism or pessimism, it's far more effective – universally – to think about separation according to context. It's usual for me to sit with my head in my hands when I watch Bradford City play, but it would be highly inappropriate to be un-moved to extreme joy during those rare moments when we've just scored a goal. Miserable people don't often get invited to parties. Contextually-speaking, if everyone else is on their feet, fist-pumping and doing things 55-year-olds shouldn't by rights still be doing, I should do it anyway... if I wish to remain part of the tribe...

...this is one of the great beauties of Edward De Bono's 'Six Thinking Hats' model. It very simply forces everyone present in the meeting to wear the same colour (hypothetical – usually!) hat at the appropriate stage of the proceedings. When we're looking for contradictions, Dr DeBono will clearly tell us, we all ought to be wearing our Black Hat. Conversely, when we're being tribal during the coffee break, Yellow is probably a more appropriate head-dress choice.

TRIZ being what it is, there are of course a host of other ways we can think about solving the Contradiction. When we encourage workshop participants to try and create the 'worst possible' solution to a problem, we're simultaneously encouraging them to do and think of dumb stuff at the exact same time getting them to do some covert serious thinking about the challenges we're all there to make sure we solve.

Similarly, there's nothing to stop me smiling along with other members of my team while we cover a Function Analysis model with red pen writing during the part of the process when we're trying to identify all the bad stuff in the system.

It pretty much all boils down to the J.P. Morgan aphorism. Or the redux version of it: people are glass-half-full or half empty for two reasons; the good reason and the real reason. The real reason for being half-empty is because it will make me more resilient as a person as well as a better problem finder/solver; the good reason for being half-full is because no-one likes spending time around a grouch. The real trick is being conscious enough to recognize that one part of our brain needs to be in half-full mode while another needs to be half-empty.

Landscapes

A few months ago we introduced the concept of #-shaped people (Issue 183, June). The main idea was to start a discussion about the sorts of skills that the world needs in our post-truth, 'had-enough-of-experts' times. The world, we speculated has too many 'vertical' skilled people and not enough 'horizontal's. Part of the thinking, too, was that there are multiple 'horizontal' integrative disciplines, such that, over time, an individual may seek to add both more horizontal skills to their portfolio as well as additional verticals.

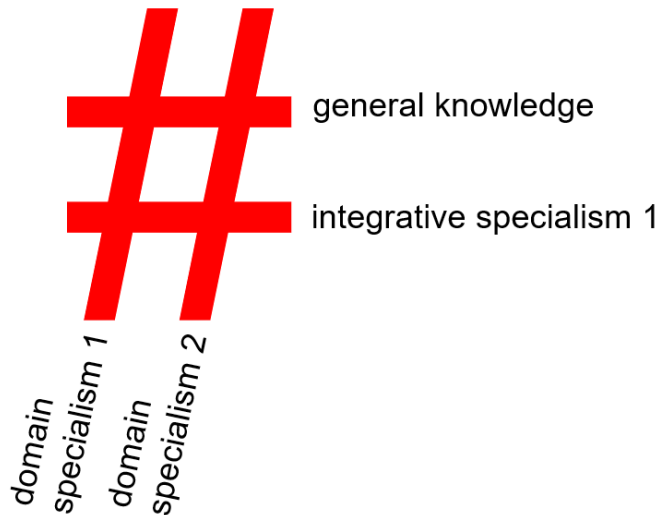


Figure 1: #-Shaped People

The more we thought about the basic model the more it feels like a valid way of mapping not just an individual's skill profile, but also all the world's knowledge. Provided we evolve the basic horizontal/vertical idea. The first extension to the initial conception was to recognize that the horizontal integrative dimensions is not so much an end to end spectrum, but rather that – because it is by definition integrative – it must wrap around upon itself. In other words, a person intent on learning an integrative skill – 'design' for example, or 'philosophy' – sooner or later comes to realise that everything comes full circle, and that we start to observe the same basic ideas and principles across all of the vertical domain specialisms we might seek to integrate into our particular horizontal story. The #-shaped model of the world might thus be more representative if we think of it like this:

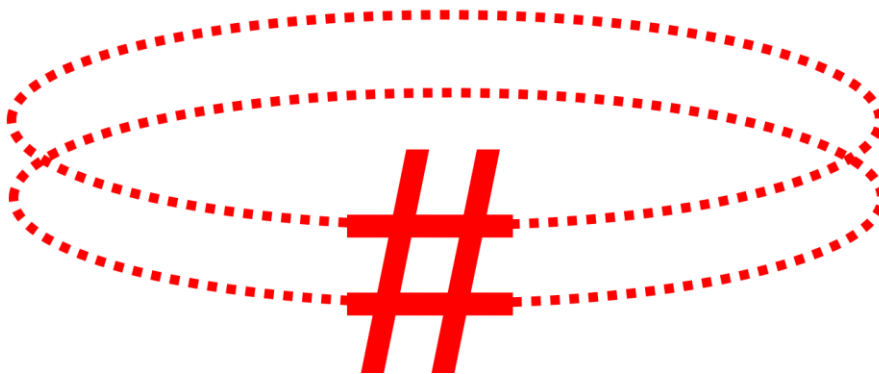


Figure 2: Integrative Specialisms Eventually Return On Themselves

Better yet, comes a realization that rather than being circular, the integrative specialisms also interact with one another and thus possess some kind of overall unifying direction in which, as we learn more and more about how the world works, we increase our (mankind's) overall level of knowledge. The circles are actually better thought of as spirals. Although we're still not quite sure how to draw the picture, Figure 3 seems to offer up at least a partial vision of what we think is happening as the world learns more 'vertical' stuff, and gets better and better at integrating it all together:

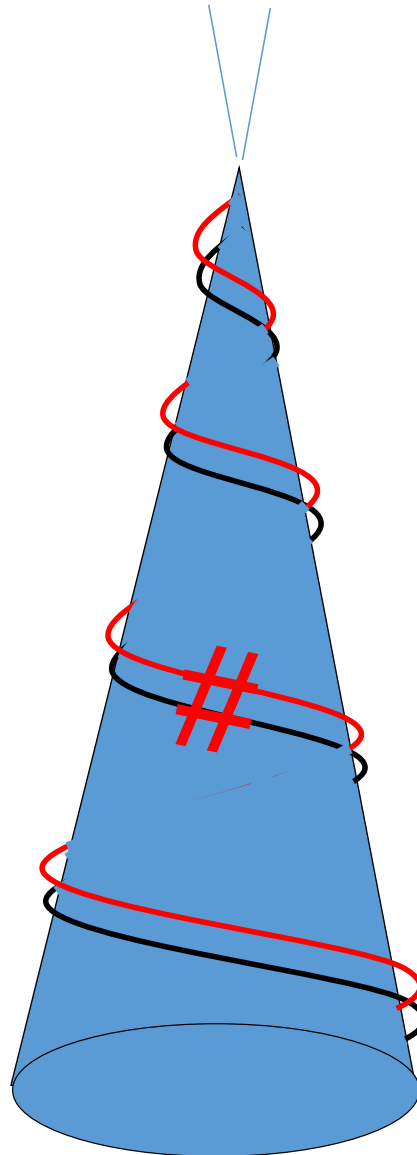


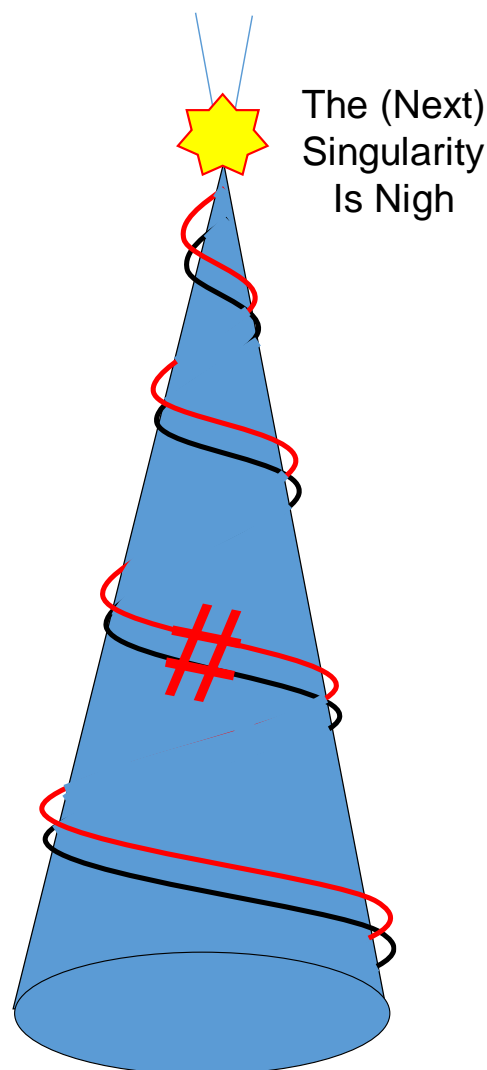
Figure 3: #-Landscape

(in reality the picture needs more spiraling integrative specialisms, and multiple vertical lines to represent the totality of different domain specialisms, but hopefully you get the idea)

If we imagine that 'progress' is about moving vertically up the cone, one of the key ideas behind this image is that, as the TRIZ concept of Ideal Final Result tells us, evolution is a convergent rather than a divergent process. As more and more of the world's knowledge gets synthesized into a higher and higher level model, we ought by rights to end up with an all-can-do 'Theory Of Everything'. Or rather, again like the IFR concept, realise that once we attain any kind of 'ideal' solution, it emerges that there's an even more ideal one over the horizon. At which point the cone diverges outwards as the knowledge paradigm makes a sea-change shift. We can see a mini-version of this 'convergence' effect with the

Renaissance period in the 14th to 17th Century. Mankind's sum pool of knowledge was such that a smart enough individual could start connecting all the dots in order to produce a better understanding of how the world worked. Then the Industrial Revolution saw an explosion of new ideas and a period of specialization. And, right now, in the first quarter of the twenty-first Century, and all of the talk of 'singularity' it seems we're right in the middle of another of these convergent periods. The 'singularity' – if indeed there is such a thing – is almost by definition the star on the point of the cone... except, of course, if the divergent-convergent model holds true it will merely be the culmination of integrating all of our current knowledge, and some smart individual (or computer) will work out what the next explosively divergent phase will be about.

All a bit too philosophical – or plain abstract! – but the takeaway point (we hope) is the image of the horizontal 'integrative specialisms' as the primary mechanism by which the sum of all of our knowledge evolves to ever higher levels.



Not So Funny – Cat Rheology



If in doubt, revert to cute cat pictures. Especially ones where the subjects have squeezed themselves into confined spaces. The Internet is full of them. Principle 29 rules.

But then, it turns out, the subject is deemed worthy of real academic analysis. Well, almost real: the author is French 😊...

On the rheology of cats

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³*Member of the Extended McKinley Family (EMF).*

(Dated: July 9, 2014)

In this letter I highlight some of the recent developments around the rheology of *Felis catus*, with potential applications for other species of the felidae family. In the linear rheology regime many factors can enter the determination of the characteristic time of cats: from surface effects to yield stress. In the nonlinear rheology regime flow instabilities can emerge. Nonetheless, the flow rate, which is the usual dimensional control parameter, can be hard to compute because cats are active rheological materials.

In true 'standing on the shoulders of giants' fashion, the author takes his inspiration from an article called 'cats are liquids', taken from the esteemed journal, boredpanda.com. He then proceeds to use some science to define what 'liquid' means:

I propose here to check if the panda's claim that the cats are liquid is solid, by using the tools of modern rheology.

First of all, 'maintains', 'adapts' or 'expands' are verbs. They describe actions unfolding with a characteristic time scale τ , which we will call *relaxation time*. From T and τ we can define the *Deborah number* as:

$$De \equiv \frac{\tau}{T} \quad (1)$$

Usually T is just the duration of the experiment, but for oscillatory flows it is the inverse of the frequency (and thus De is analogous to a Strouhal number). The relaxation time τ can have a variety of origins. When one seeks the difference between gas and liquid, 'relaxing' will mean 'expanding' and so τ will be linked to the characteristic rate of expansion of the material.

And from here, we see:

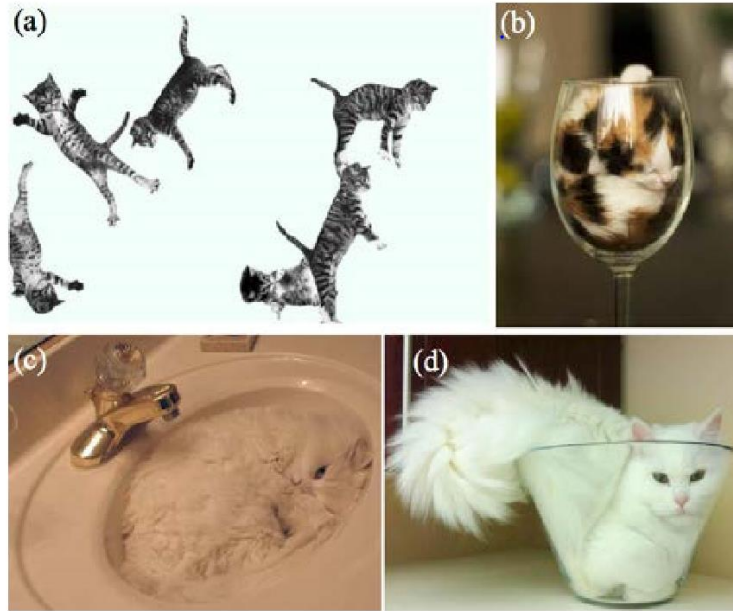


FIG. 1: (a) A cat appears as a solid material with a consistent shape rotating and bouncing, like Silly Putty on short time scales. We have $De \gg 1$ because the time of observation is under a second. (b) At longer time scales, a cat flows and fills an empty wine glass. In this case we have $De \ll 1$. In both cases, even if the samples are different, we can estimate the relaxation time to be in the range $\tau = 1$ s to 1 min. (c-d) For older cats, we can also introduce a characteristic time of expansion and distinguish between liquid (c) and gaseous (d) feline states. [(a) Courtesy of <http://cat-bounce.com>, (b) <http://www.dweebist.com/2009/07/kitten-in-wine-glass/>, (c) <http://imgur.com/gallery/UuNSR>, (d) <http://imgur.com/s7JtV>]

And then:

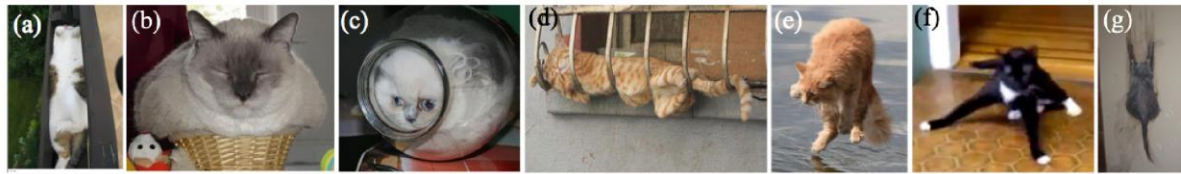


FIG. 2: (a) Extensional rheology of a cat before capillary break-up. (b) Cat on a superhydrophobic substrate showing a high contact angle. (c) Tilted jar experiment showing the yield stress of a kitten. (d) Spreading of a cat on a very rough substrate. (e) Low affinity between cats and water surfaces. (f) Sliding cat on smooth floor. (g) Adhesion of a cat on a vertical wall. [Courtesy of (a) facebook.com, (c) <http://metro.co.uk/2011/02/18/ksyusha-the-kitten-is-cat-in-a-jar-639735/>, (d) <http://www.theyfailed.com/cats-sleep-anywhere/>, (f) <http://www.mirror.co.uk/news/world-news/youtube-watch-hilarious-viral-of-two-882779>, (g) http://amazinghandpaintedmurals.com/picture-gallery-_-page-3]

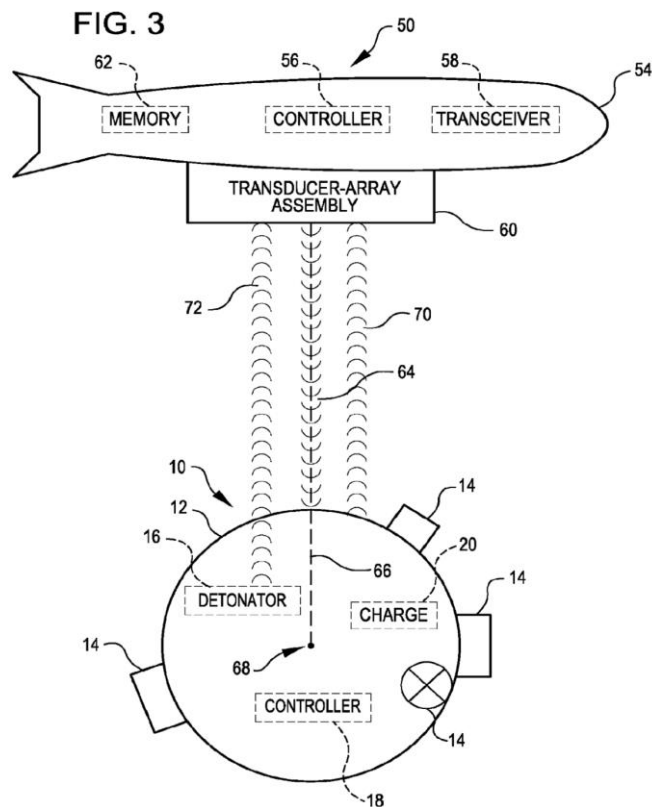
Sadly, from this promising start, the study ran into a few problems. And so ultimately, all we're left with is this tantalizing finale:

In conclusion, much more work remains ahead, but cats are proving to be a rich model system for rheological research, both in the linear and nonlinear regimes. Standing questions include the potential implications of the rheology of cats on their righting reflex, and whether the nonlinear self-sustaining mechanism for turbulence in pipe is applicable to streaks of tigers. Very recent experiments from Japan also suggest that we should not see cats as isolated fluid systems, but as able to transfer and absorb stresses from their environment. Indeed, in Japan, they have cat cafes, where stressed out customers can pet kitties and purr their worries away.

The paper was one of the big winners at this year's Ig Nobel Awards ceremony. This is where you need to go to find out the other winners: <http://www.improbable.com/ig/winners/>

Personally, I'm still debating whether the Peace Prize winners, a joint team from Switzerland, Canada, The Netherlands and USA, with their work demonstrating that regular playing of a didgeridoo is an effective treatment for obstructive sleep apnoea and snoring, or the Economics Prize, presented to a joint US, Australia team for their experiments to see how contact with a live crocodile affects a person's willingness to gamble, should have won the overall Award. Ultimately, it just goes to show, Principle 29 Cats always trump Principle 18 (didgeridoos) and Principle 38 (crocodiles).

Patent of the Month – Target Neutralization



I love obvious. Sometimes a solution can look so obvious, you have doubts that it is real. Then you notice that the owner is Lockheed, so you realise, hmm, maybe there's something interesting happening here. The solution in question is found in our Patent Of The Month this month, US9,753,134, granted on September 5. The subject is neutralization of enemy targets. The exemplar is subsea mines. There's not much of a description to go by, except to say that the prior art recognizes that the use of pulses of acoustic energy are a potential way to neutralize mines. But then, there's a problem:

...there may be challenges with the implementation/deployment of such a shockwave-pulse technique. For example, the intensity of a shockwave required to neutralize the mine from a safe distance may be so high that the sizes of the energy source and of the shockwave-generating aperture may be impractical. For example, if it is estimated that the intensity of the shockwave required is 330 dB or higher, then the power needed to generate such a shockwave may be on the order of hundreds of kilowatts (kW), and the size of the aperture needed to generate such a shockwave may be on the order of a few hundred feet in diameter, width, or length. Furthermore, such a high acoustic intensity may harm nearby fish, mammals, and other wildlife, and even divers who may be significantly farther away than the targeted mine is. For example, if the mine to be neutralized is 500 meters from a source that is generating a shockwave pulse that needs to have an intensity of 330 dB of acoustic pressure at the mine, then such a pulse may deafen or otherwise permanently damage the hearing of a diver at a distance of 100 kilometers (km) or more! And it is generally accepted that an acoustic shockwave pulse even as low as 140 dB may harm fish, underwater mammals, and other underwater life; consequently, a pulse of 330 dB at a distance of 500 meters from the generating aperture may have a devastating influence on marine life over a vast area centered at the shock-generating source.

Sounds like a contradiction: we want to neutralize the enemy mine, but we don't want to neutralize the marine life living within a hundred-mile radius. Here's what the Contradiction Matrix has to say about the problem:

IMPROVING PARAMETERS YOU HAVE
SELECTED:

Function Efficiency (24)

WORSENING PARAMETERS YOU HAVE
SELECTED:

Noise (29) and Harmful Emissions (30)

SUGGESTED INVENTIVE PRINCIPLES:

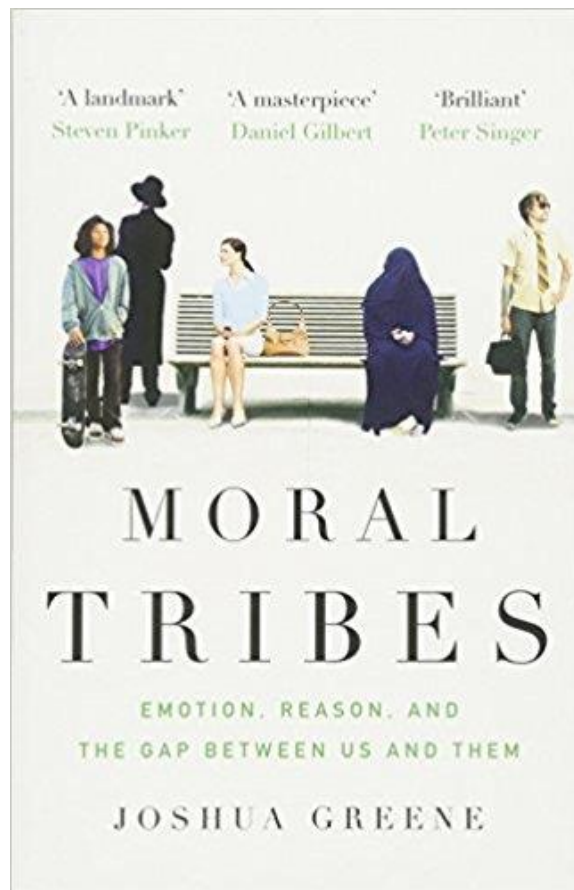
4, 14, 35, 9, 24, 3, 18, 28, 1, 22, 2, 13,
15

And here's what the patent solution does to solve the problem:

...an apparatus includes a transducer array and a controller that is operable to cause the transducer array to generate a signal having a frequency, and to direct the signal toward an object having a resonant frequency that is approximately equal to the frequency of the signal. For example, an embodiment of a mine-hunting-and-neutralizing apparatus may generate an acoustic wave with a transducer array, and may disable or destroy a mine by directing the wave toward the mine. The apparatus generates the acoustic wave having a frequency that is approximately equal to the natural frequency of a component of the mine such that the wave causes the component to resonate in a manner that is sufficient to disable the mine from detonating, or that is sufficient to cause the mine to detonate. For example, if the component is the detonator, then the wave causes the detonator to resonate at an energy level that is sufficient to render the detonator unable to detonate the mine, or that is sufficient to cause the detonator to detonate the mine.

Aah, Principle 18C, where would we (and our marine friends) be without you?

Best of the Month – Moral Tribes

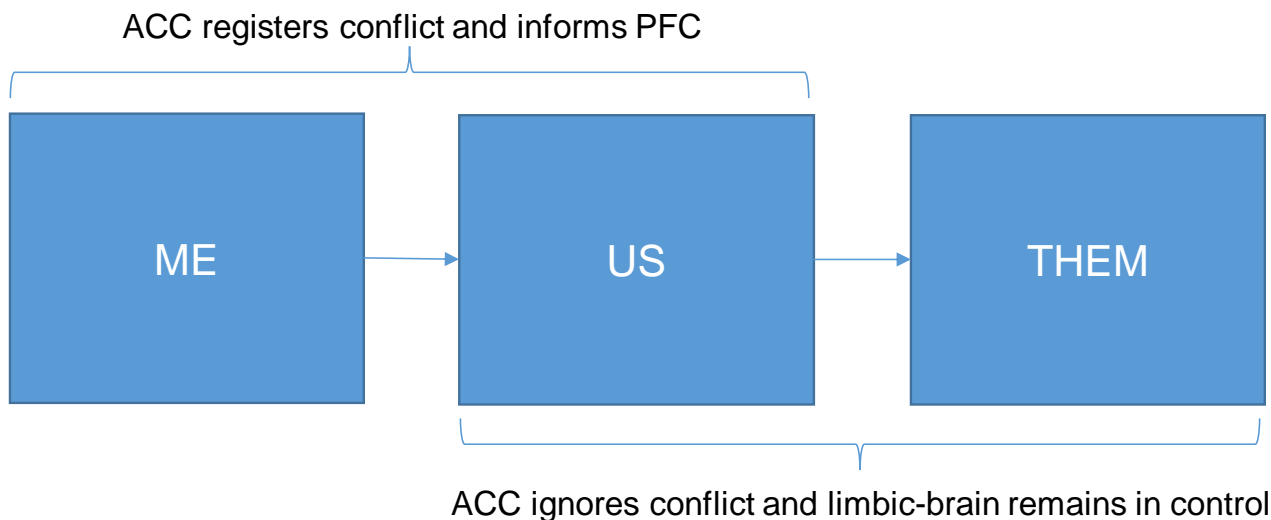


At over 350 pages long, this book doesn't give the immediate impression of being an easy read. The chapter headings don't do anything to alter that perspective: there's a lot of moral philosophy, evolution theory and brain physiology going on here. That said, one of the main reasons Joshua Greene's epic gets the 'Book of the Month' slot is because when you're actually reading the book it flows by effortlessly. The overall story is beautifully constructed and the arguments made in such a way that they are very easy to follow. Greene doesn't try to brush any inconvenient truths under the carpet, such that, when he does go wrong – and he does do that on several occasions (if only he knew some TRIZ Part #496) – you can see where the problem occurs and then head yourself off down a more productive tangent. I ended up writing several pages of notes relating to some of these tangents. Moral Tribes + TRIZ makes for some very fruitful new insight.

Fortunately, Greene's overall premise is a very solid one. It builds from a model of the world in which a distinction is made between an individual, the 'us' tribe(s) that individuals belong to and the 'them' that represents everyone else outside the tribe. Humans have evolved in such a way that there are evolutionary benefits to being social and a valued member of the tribes we are members of. Our brains have evolved in such a way that when we identify conflicts – say between what I want and what the tribe wants – our rationalising brain (prefrontal cortex) is tasked with resolving the conflict. We identify the conflicts because we have a part of our brain that is tasked with noticing them when they occur. This is our Anterior Cingulate Cortex (ACC). So far so good.

From a TRIZ perspective, we have an inbuilt contradiction radar.

But. Here comes the crux of the ‘moral tribes’ premise: when a conflict occurs between ‘us’ and ‘them’ our ACC doesn’t spot it and so our prefrontal cortex never gets triggered to try and resolve the conflict. When ‘them’ is different from ‘us’, our ACC effectively says, ‘well of course they’re different, they’re not one of us, there is no conflict we need to solve’. Which then means our emotional (limbic) brain does the thinking and more often than not the inter-tribal tensions and differences get magnified. Different tribes tend not to communicate effectively because our brain fools us into thinking there’s no (evolutionary) advantage to cooperating and actually solving the differences:



This is pretty important stuff from both a TRIZ and a societal perspective, I think. And if I took nothing else away from the book than this insight, I’d consider my 4 days of reading a good investment.

It’s a great thought I think. If Greene had stopped at this point, I think Moral Tribes would have been a classic. Unfortunately, Greene goes on to build on the foundation to build a series of solution strategies. This is where some knowledge of contradiction-solving would have been really useful. And some idea of ideality.

The key flaw in the argument – in my TRIZ-biased opinion, of course – is that he assumes that ‘greatest net happiness’ is the measure that should be deployed to resolve us-versus-them conflicts, i.e. any conflict resolution necessitates a compromise, and the best way to make that compromise fairly is to have a like-for-like measure that everyone agrees upon.

There are two big flaws with this argument. The first is establishing that ‘happiness’ is ‘the’ right measure. The second is that it is necessary to compromise. The almost universal failure to solve the biggest us-versus-them problems in the world is because compromise is a naïve aspiration. Solving big problems means finding contradiction breaking solutions. That’s where TRIZ most obviously comes to the rescue.

More subtly, it would also tell us that there very likely is no such thing as ‘the’ right measure of success. It depends. Sometimes it might be happiness. Other times it might be power. Or Meaning. Or Quality of Life.

The gaping flaws of Greene’s happiness solution really become apparent when he tries to deploy them on some big problems. It takes a lot of bravery to tackle, for example, the Pro-Life-versus-Pro-Choice us-versus-them conflict. For that I definitely admire Greene’s bravery. But when he concludes that Pro-Choice is the ‘right’ solution because it generates the overall higher level of happiness, I can’t imagine a single Pro-Life

campaigner being in the slightest bit convinced to change their mind. In an ideal world, I'd love to be able to scrub these 'therefore...' solution chapters and replace them with some TRIZ. Then this book really would have been a classic. As it is, we can give Joshua Greene a big thankyou for doing half a job, and then start to imagine the other half: a new world of contradiction-breaking win-win solution strategies that keep being deployed until such times as there is no longer any 'them' to conflict with.

Wow In Music – The Steely Dan Chord



In memory of Steely Dan co-founder, Walter Becker, who sadly died this month, we look at one of the most distinctive bands of all time. Distinctive in that they pretty much defined the soundtrack of my formative years. And distinctive too in that there's a certain chord that, the moment you hear it you know you're listening to Steely Dan.

Ok, so no band has strictly speaking invented a chord. And Steely Dan weren't the first to use 'their' chord. Miles Davis, Charles Mingus, Thelonious Monk and Dave Brubeck used it throughout the 1950s. In the 1960s and most of the 1970s, adventurous and ambitious horn-adorned groups like Chicago and Blood, Sweat and Tears also experimented successfully with it too. But somehow, the way Steely Dan used it makes you immediately think of them and not anyone else. Call it a Principle 20 chord.

It's pretty much accepted by the general populace how great the writing/performing talents of, say, Billy Joel, Elton John and Paul McCartney are. But, and it's a big but, how many of the aforementioned people have kept their musical sound progressing, fresh, new, exciting, consistently musically top-flight and expend inordinate amounts of time and energy into the total compositional process?

First of all we must acknowledge that Steely Dan is a very different animal indeed. Both Donald Fagen and Walter Becker have a deep appreciation for and understanding of the language of different kinds of musical styles (especially the career re-start, Impressionistic era [listen to the chorus section of "Gaslighting Abby" for some nice whole-tone chord planing techniques that Debussy would've loved] and the Cool Jazz era [the splendiferously hip chordal sequences of the intros to "Peg," "Dr.Wu" or throughout "Aja" harken the chords/voicings that Gil Evans favored in his 1950s arrangements for Miles Davis for example]). They also understand, unlike most other "pop" music acts, how to write for/voice/orchestrate instruments other than their own. Even before they became known as Steely Dan, when they were working for Jay and The Americans, they wrote/orchestrated string and horn parts on the *Capture the Moment* album. On most of their own albums they either worked in conjunction with other arrangers such as Tom Scott (*Aja* and *Gaucho*) or Rob Mounsey (*Gaucho*) or did it all by themselves (*Two Against Nature* and *Everything Must Go*) when writing the horn (brass and woodwind)

parts. Check out the liner notes on most McCartney, Joel or John albums and see who did the rhythm/string/horn arrangements—you'll usually find names other than theirs listed.

With the Dan sound it's all about the VOICINGS of those great chords -what instruments get which notes to play and when—that form what we hear and call the Steely Dan Sound.

A terrific, behind-the-scenes peek into how the Dan went about creating their sounds can be found on the Rhino Company's Classic Albums video series featuring Steely Dan's almighty album *Aja*. Sitting at the recording console, Donald and Walter pick apart many of the sonic details that went into creating those enduring sounds we hear on especially "Deacon Blues," "Peg" and the title cut "Aja." At one point in the video Donald and Walter are discussing how they were looking for a certain instrument to play the high notes of the melody in the middle section of "Deacon Blues." After experimenting with writing an actual flute part "that didn't quite cut it" they ended up using a flute-like simulation done so tastefully on a synthesizer.

Longtime Dan guitarist Denny Dias reminisces about playing on "Aja" saying, "there's clusters (of notes) so close together that you can't stretch your fingers out enough to get all the notes at the same time. There are open voicings that are so wide apart that you can't reach all the notes."

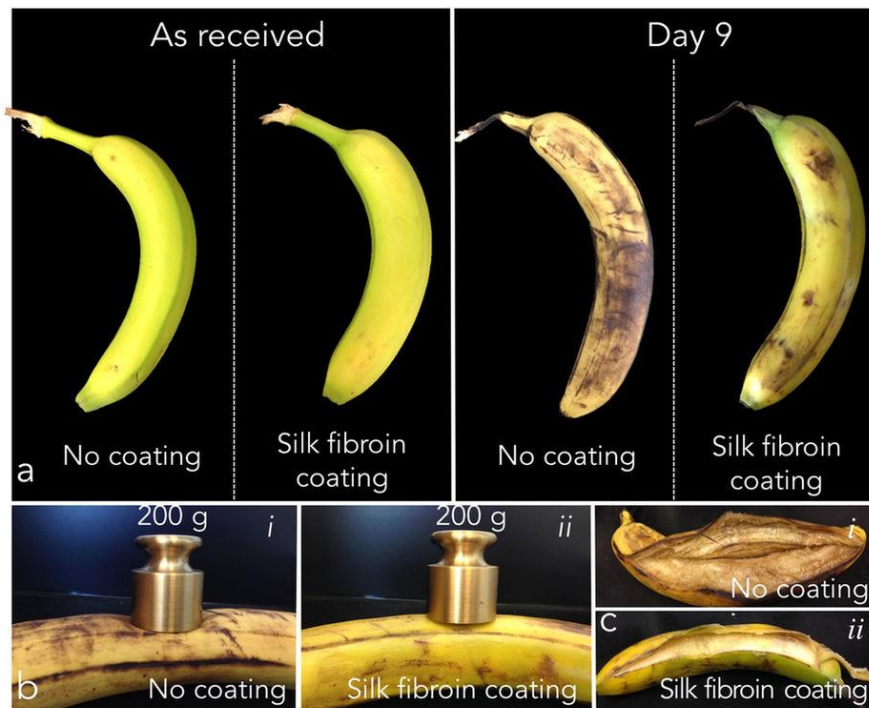
Singer-great Michael McDonald (a previous ezine musical-wow subject) reflects about laying down the vocal harmony tracks for "Peg" stating that " "Peg" doesn't sound like much of a part, but, the harmonies (voicings) are so close. That was a real learning experience for me to sing the chords part by part myself."

Visit to Howard Wright's excellent web site (<http://www.hakwright.co.uk/steelydan/mu-major.html>) to hear an extensive/exhaustive insight as to what makes the Dan sound so special. He states that it is the consistent/constant use of what the Dan call (using their own innovative and jocular term) the Mu Major Chord (which for music theory buffs is basically a major triad with an added major 2nd). Howard states that, "the chord itself is not unique to Steely Dan—but the way Donald and Walter used the chord, the voicings they chose, and the chord changes they used, made it something rather special in Steely Dan music." He adds that, "using different voicings for the chord alters its sound, and there are some particular voicings that are used frequently in Steely Dan songs, giving a distinctive sound." Howard breaks down the Mu Major voicings into two distinct categories: Type I (pre-*Royal Scam*) and type II (especially on *Aja* and *Gaucha*) Mu voicings. The Type II Mu Majors are referred to by Howard as the "Classic Voicings" which are found/heard in "Deacon Blues" and "Black Cow" (from *Aja*)—"classics" indeed.

Also at Howard's site one can listen to/download in WAV/MP3 formats, either a sound collage of the Mu Major Chord from actual Dan songs or sound examples (played on electric piano) of the distinct and individual voicings of the chords. (They all use Principle 2, Separation, which is a big part of the voicing trick.) Once the listener becomes aurally familiar with the sounds of the various voicings of the chord played by rhythm instruments, he/she should especially listen to how the horns (brass and saxophones) sound playing the Mu Major in different voicings—check out "Deacon Blues" and "Home At Last" from *Aja* and "Babylon Sisters" and "Gaucha" from *Gaucha*. The Dan created a whole new and unique musical timbre and style as a result.

As far as I know, nobody on the popular music scene has consistently done or is doing what the Dan has to create their own (quasi) musical language and sound. Maybe the understated guitarist Dean Parks summed it up best about the Dan sound when he said, "it is quite an amalgamation that's for sure—and it's interesting to note that it can be a hit."

Investments – Silk Coating



Food waste has an impact on food quality and safety, representing a loss of economic value and resources, and, a hindrance to economic development. The Food and Agriculture Organization (FAO) of the United Nations has estimated that one-third of the food produced for human consumption worldwide is annually lost or wasted along the chain that stretches from farms to postharvest treatments, processing, distribution and end-user consumption. For fruit and vegetable commodities, the FAO has estimated a 50% loss of crops throughout the food supply chain, mainly concentrated in the postharvest, distribution and end-user consumption stages and mostly due to the premature deterioration of perishable crops.

Many perishable fruit and vegetables possess in fact high metabolic activity and suffer from high possibility of microbial contamination, resulting in short shelf-life, fungal decay, colour change, and off-flavour. To date, several treatments have been explored to extend the postharvest life of fruit and vegetables (e.g. cryopreservation, exposure to synthetic chemical fungicides, modified atmosphere packaging, osmotic treatments, hypobaric and heat treatments). In this scenario, the formation of an edible coating represents an alternative route to extend crop freshness by combining extended storage periods with ease of handling. In general, food coatings should be mechanically robust matrices with hydrophobic groups to exert low permeability to oxygen and water vapours (i.e. control over fruit respiration rate and firmness retention). Biocompatibility, biodegradability, antibacterial and antifungal activities, membrane forming capacity and safety (i.e. edible and not allergenic) should also be compelling properties for an edible coating material.

To date, polysaccharides, proteins, resins, lipids and their combinations are the commonly used options for coating formulations. Polysaccharides and proteins are known to form films with good mechanical properties, but with poor permeability, while lipids and resins form brittle films with improved permeability. Among all the perishable food, strawberries are considered one of the most difficult to preserve fresh along the food supply chain and

have therefore been used as a model to test the efficacy of food preservation strategies and, in particular, of edible coatings.

Silk fibroin is an extensively investigated biomaterial for its potential in textile, biomedical, photonic, and electronic applications. Silk fibroin is a structural protein, like collagen, but with a unique feature: it is produced from the extrusion of an amino-acidic suspension by a living complex organism (while collagen is produced in the extracellular space by self-assembly of cell-produced monomers). Silk fibroin properties are derived from its structure, which consists of hydrophobic blocks staggered by hydrophilic, acidic spacers. In its natural state, silk fibroin is organized in beta-sheet crystals alternated by amorphous regions, which provide strength and resilience to the protein. The multiplicities of forms in which regenerated silk fibroin can be processed at a high protein concentration and molecular weight make it attractive for several high-tech applications, as recently reported. In addition, the amino-acidic nature of silk fibroin brings a diversity of side chain chemistries that allows for the incorporation of macromolecules useful in drug delivery applications or in providing cellular instructions.

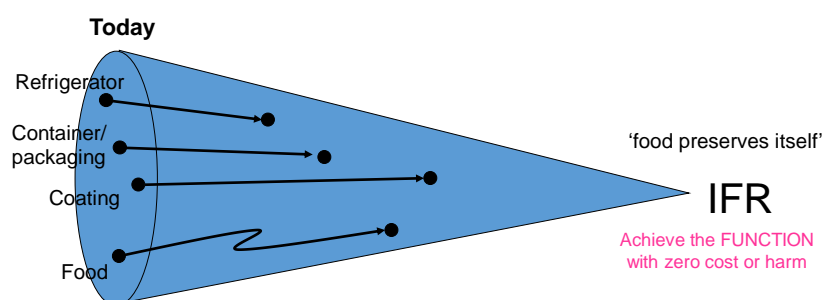
Remarkably, silk fibroin has also shown to possess features that are distinct of its regenerated form. For example, regenerated silk fibroin stabilizes heat labile molecules and compounds (e.g. enzymes and antibiotics). Silk is indeed considered a platform technology in biomaterials fabrication as its robustness and qualities bring needed assets to provide a portfolio of distinct features (e.g. nanopatterning, biochemical functionalization) for the final construct. Processing of regenerated fibroin generally involves the partial or total dehydration of a fibroin suspension (protein content of 1–15 wt%) to form films, sponges, gels, spheres (micron- to nano-sized) and foams with numerous techniques (e.g. solvent casting, freeze drying, salt leaching, sonication). The rationale beyond these fabrication processes is to manufacture a robust material that combines mechanical strength with ad-hoc biochemical properties.

The silk-fibroin research recently went public when it won the Rabobank-MIT Food & Agribusiness Innovation Prize competition for the development team at Tufts University.

The fibron—which is 99 percent water and one percent silk—is virtually undetectable, explains Jacques-Henry Grislain, CEO of Cambridge Corps, the University spin-out company now tasked with commercializing the technology. “The coating is one-tenth of thickness of hair, has no taste, and prevents oxidation and the ripening of fruit,” Grislain explains. The fibron coating acts as a protective barrier and is an alternative to current means of extending shelf life, like cold storage and 1-methylcyclopropene, which blocks the ethylene that triggers fruit to degrade.

Grislain says that while Cambridge Corps aims to make the coating a global commercial product, the team is hoping to have the greatest impact on the developing world, where food wastage is typically over 50%.

Lots of players have a stake in the food preservation story:



Coatings won't be the ultimate winners, but the Cambridge Crops solution looks like as close to IFR as the coatings industry will ever get. Which means, if the commercialization plans go well, the refrigerator and, especially, container & packaging industries had better watch out.

Generational Cycles – Mid-Life Crises



I know not everyone reads this part of the ezine. It nevertheless follows the same philosophy as all the other parts of our research activity. And that includes the idea of constantly challenging what we find rather than trying to confirm what we've already found. When we first encountered the Strauss & Howe generation-archetypes model in the late 1990s we were skeptical from the get-go. Everything we've subsequently done to challenge the model has almost invariably ended up confirming both the overall premise and the large bulk of the details. Sometimes we find things that alter the detail. Sometimes, we make connections that cause us to expand and refine the overall premise of the model. When we integrate a knowledge of complex adaptive systems into the Strauss & Howe model we came to realise a much more powerful way of using the model. It seems clear that despite their excellent pattern finding skills, neither Strauss nor Howe understood complexity,.

A few months ago we came across an online article that seemed to be adopting the same challenge approach that we use. Great, we thought, someone doing some hard work for us. Only then we read what was being written and realized the words came from a person with, how shall I put this, a vested interest in dis-crediting the model. Rather than trying to find a better model. All theories are wrong, but some are useful. If we're to achieve scientific rigour a theory needs to be falsifiable and able to be used to make predictions. The attacking author uses these words but – we think – mangles the arguments in order to achieve their pre-conceived objective of discreditation. You might want to have a look at it in order to make your own judgement: <https://qz.com/970646/the-world-has-already-bought-into-steve-bannons-apocalyptic-ideology/> You'll perhaps also spot fairly quickly why the article's author has a desire to rubbish the Strauss & Howe work (i.e. it's Steve Bannon's play-book for the next 15 years of US history). We'll come back to it next month to explore how, because the author, like Strauss & Howe, also doesn't understand complexity, they end up making dumb arguments.

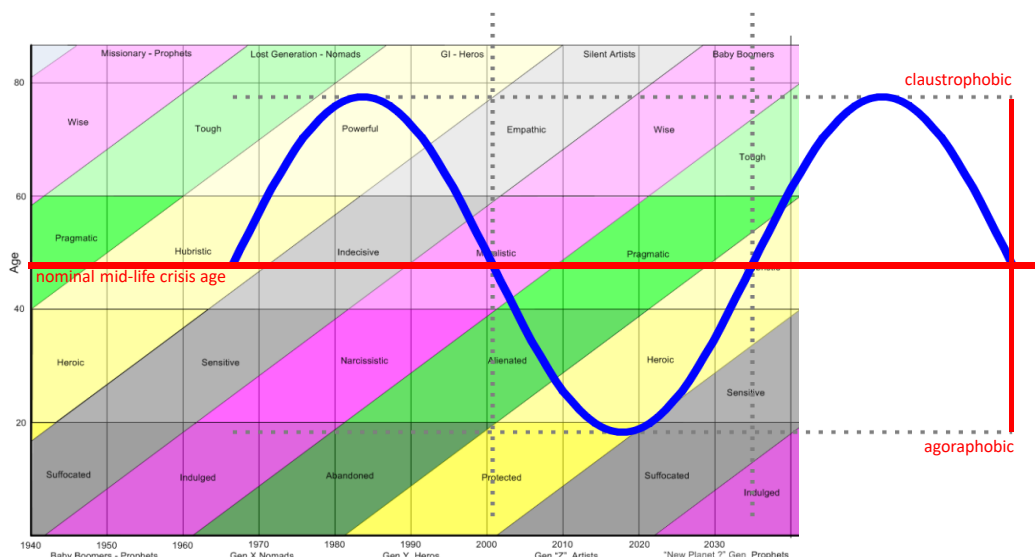
Meanwhile, the theme of this month's article is to begin the process of potentially adding a new refinement into the overall model. Mid-life crises. All humans that reach mid-life, since time immemorial appear to go through some kind of crisis. In true complex systems form,

every crisis is different. In true pattern-finding research mode, they all seem to be different in the same way. Or rather four ways.

Right now in 2017, demographics being what they are, it's the turn of Generation X to be going through the mid-life crisis transition. A crude Google search will quickly reveal a small armada (I'm not sure what the proper collective noun for large numbers of angst-ridden, existentially-challenged individuals is) of Generation X authors writing on the topic at the moment (e.g. <https://jezebel.com/5535531/gen-xs-midlife-crisis-will-not-be-televised> - I particularly enjoyed the insightful brevity of this one). They all have a different message, but they also seem to have the same message. Strauss and Howe's biggest skill I think has been to look beneath the surface to find the underlying patterns. With Nomad generations – which is what Xers are – that underlying pattern is 'agoraphobia'. Nomads, by very dint of their title label have been (forced to be) outward looking travelers. When the crisis then comes, agoraphobic means you begin to become afraid of or 'averse to' the big wide open and tend to retreat inwards. It is also seen as a 'fear of being in situations where escape might be difficult or that help wouldn't be available if things go wrong'. Not everyone, of course, and very likely not in any kind of clinically diagnosable sense – part of the beauty of the Strauss & Howe thinking has always been to find emotive words to vividly characterize large groups of similar people in an insight-delivering manner. 'Insight' doesn't mean universal, it means the emergence of a new way of seeing an otherwise familiar situation. Survey all mid-life crisis afflicted Xers and no doubt (unless they refused to answer the question – also quite likely!) we'd find ourselves constructing a scale spanning a range from agoraphobic to its opposite, claustrophobic, and discover there is a spectrum. What we'd also see is that the mean and median of this spectrum would be much closer to agoraphobic than the claustrophobic.

By the same token, if we did the same thing with Artist generations (the Silent Generation, born between the two World Wars being the most recent one to have been through their mid-life crisis period), we'd find that the mean and median on their agoraphobic-claustrophobic spectrum was significantly further towards the claustrophobic: they haven't generally been Nomadic, but have rather been much more internally-focused as a cohort, and consequently when crisis comes it is born of that internal stuck-ness – 'let me out of here'.

If we plotted the societal shift of this agoraphobia-claustrophobia spectrum at mid-life crisis as a function of time, I think we end up with something that looks like this:



The nominally sinusoidal curve is intended to show mid-life crisis 'claustrophobic-angst' peaking at the centre of the Artist generation in their mid/late forties, and the (current) Nomad generation agoraphobic angst peaking around the middle of the same period in their lives.

If the sinusoidal oscillation is right, it would imply that the intermediate generations – the Prophets (Boomers) and the Heroes (GenY, Millennials) – find themselves relatively speaking on neutral ground when it comes to claustrophobic or agoraphobic behavior.

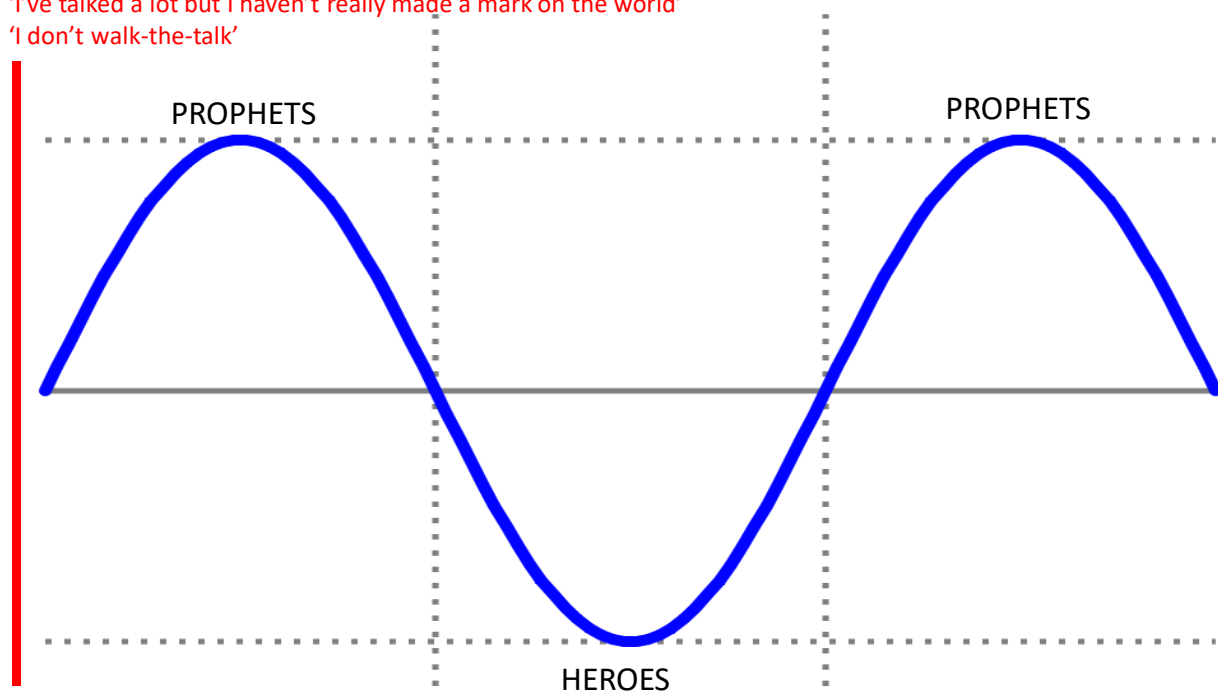
Which in turn, perhaps – if we're trying to do the Strauss & Howe job of getting underneath the skin – begs the question: is there a different kind of oscillatory pattern that characterizes the mid-life crises of the Prophets and the Heroes?

We think there is. We think it looks something like this:

Under-achievement

'I've talked a lot but I haven't really made a mark on the world'

'I don't walk-the-talk'



Over-achievement

'I solved all the problems, now there's nothing left to do'

'My best days are behind me'

It's an idea we'll come back to next month when we also try to unravel the 'pseudo-science' article flaws and seek a deeper understanding of both the overall GenerationDNA model in general and mid-life crises in particular.

Biology – Cuckoo Eggs



The main attribute of the cuckoo is that it lays its eggs in other birds' nests in order that other birds raise their offspring for them. We've mentioned this story in Issue 147 of the ezine. What we didn't mention was the fact that, in order to ensure that the unfortunate surrogate parent bird doesn't throw the cuckoo egg out of their nest, it has to be disguised to look like the eggs that are already there. They need to be the same colour and the same shape. Cuckoo eggs in other words, need to look different depending on the species of the surrogate parent bird.

For roughly a century, researchers have been trying to figure out how different female cuckoos manage to lay such a variety of different egg colors to match different host birds. Now, a group of researchers at the Norwegian University of Science and Technology (NTNU) has come up with an answer to this puzzle, in cooperation with researchers from all over Europe and Asia.

The short answer is that "the female bird decides everything," says researcher Frode Fossøy.

Fossøy is part of the cuckoo research group at the Department of Biology at NTNU. The results of the group's work have just been published in *Nature Communications*. "We've been able to show for the first time that the blue egg color is inherited via the female cuckoo only. The father has no effect on the color of his daughter's eggs," says Fossøy.

Researchers have investigated a wide variety of samples from Europe and Asia. They found a clear relation between blue eggs and genetic material that only comes from the mother (mitochondrial DNA), and no relation between egg color and genetic material that comes from both parents (nuclear DNA).

Cuckoos (*Cuculus canorus*) are parasitic. Female cuckoos lay their eggs in the nests of other bird species, as is well known. The young cuckoo then usually throws the other chicks out of the nest, getting rid of any competition for the parents' attention.

Potential host birds develop traits to prevent being tricked by the parasites – they get rid of eggs that don't look like their own. To avoid this, female cuckoos need to lay eggs that look identical to that of the host bird's, both in color and shape.

This means that there is a sort of evolutionary arms race going on between cuckoos and host birds, where cuckoo eggs come to resemble that of their host birds' more and more over time.

Different cuckoos can therefore lay eggs of many different colors and patterns. They can be blue, brown, green or grey, and have different combinations of spots and patterns. But

each individual female cuckoo can only lay eggs in one color, so different females specialize on different host species. This is part of the reason why egg color is a trait inherited only from the female birds.

Males may make a mess of things

The research group doesn't have definitive proof that all egg characteristics are inherited from the female bird, just that blue eggs are. Whether other egg colors are also only inherited via females is currently not known.

There has been speculation that cuckoos that lay blue eggs may actually be a different species, but no other characteristics indicate this. The nuclear DNA of the birds that lay blue eggs is the same as any other cuckoo -- meaning that the species is the same.

A single male cuckoo can mate with several female birds that lay eggs of different colors. This could make a mess of things. If a male with genes for one color mated with a female with a different egg color, their daughter's eggs could be an intermediate color that doesn't match any host, meaning that host birds would be able to spot the difference and get rid of the parasitic egg.

For this reason, there are evolutionary advantages for both the male and female birds that only females carry the genetic trait for egg color. That way, their offspring will have a much greater chance of surviving.

The overall problem the cuckoo has had to evolve in the arms-race is being able to lay the right colour and shape of egg in the right surrogate nest. Here's what the problem looks like from a Contradiction perspective:

IMPROVING PARAMETERS YOU HAVE
SELECTED:
Productivity (44)

WORSENING PARAMETERS YOU HAVE
SELECTED:
Compatibility/Connectivity (33)

SUGGESTED INVENTIVE PRINCIPLES:
10, 2, 13, 28, 24, 1

Which seems to match up well with the evolved solution:

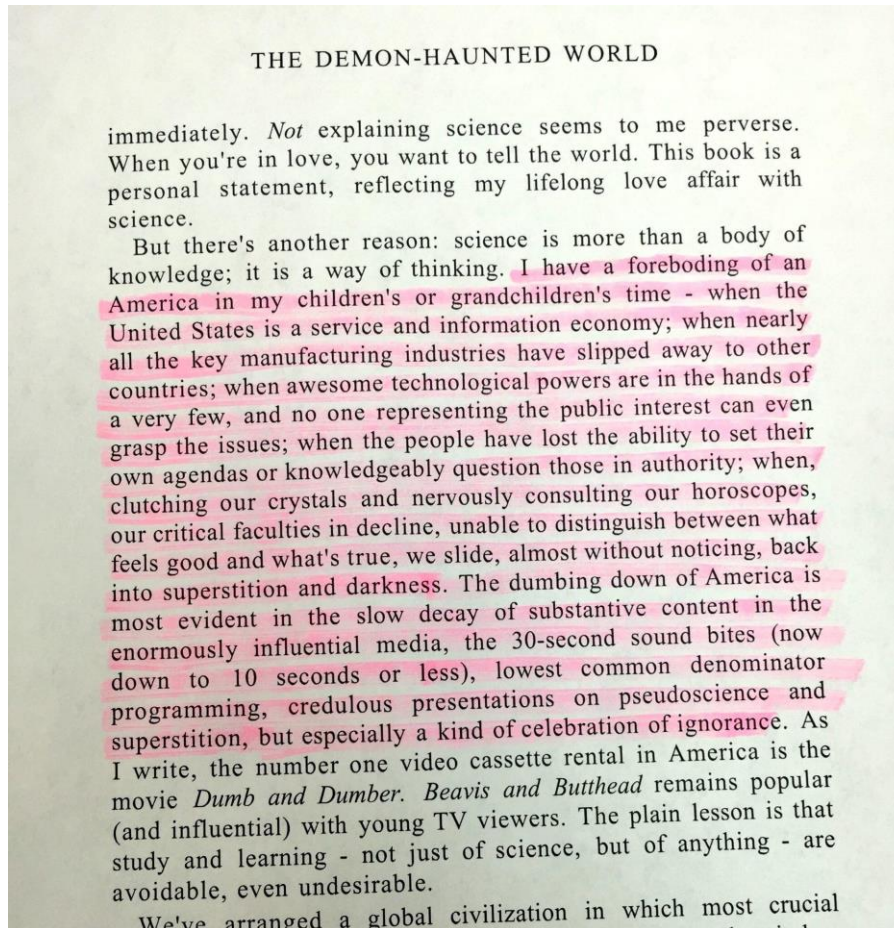
- Principle 10/Principle 1 – different females specialise in different surrogate species
- Principle 2 – take out the influence of the (random) male cuckoos

Journal Reference:

Frode Fossøy, Michael D Sorenson, Wei Liang, Torbjørn Ekrem, Arne Moksnes, Anders P Møller, Jarkko Rutila, Eivin Røskoft, Fugo Takasu, Canchao Yang, Bård G Stokke.

Ancient origin and maternal inheritance of blue cuckoo eggs. *Nature Communications*, 2016; 7: 10272 DOI: [10.1038/ncomms10272](https://doi.org/10.1038/ncomms10272)

Short Thort



Carl Sagan, 1995.

News

IMechE TRIZ Webinar

A final reminder regarding Darrell's one-hour '21st Century TRIZ: Breakthrough Problem-Solving Without The Learning Curve' webinar for the IMechE on Friday 29 September at 12.30 UK time. Register for free here: <http://www.imeche.org/training-qualifications/training-details/21st-century-triz-breakthrough-problem-solving-without-the-learning-curve>

Austria

Flights are now booked and everything confirmed for the Innovation Kongress in Villach in November. Darrell will be keynoting on the morning of the 16th, with 'Evolving TRIZ - Solving The Efficacy-Complexity Contradiction To Deliver Tangible Innovation Success', and conducting a joint PatentInspiration/PanSensic workshop all day on the 14th. Details from <http://www.innovationskongress.at/> and the SI website respectively.

Buckingham MSc

Following the successful 'Foundation Week' for both the MSc in Lean Enterprise and the MSc in Structured Innovation this month, we're all set for the formal launch in January. The first Module will take place during the week 8-12 January. As with the Foundation

Week, provided delegates are registered as Buckingham students, they can take the Module and sign up for the full MSc at a later date.

Register here: <https://www.buckingham.ac.uk/business/msc/structured-innovation>

Japan

Well, it's been a long time, but it looks like Darrell will be making a trip to Japan in November/December. The current plan is for an in-house client session, but there should be an opportunity to organise something either side of these dates if any of our ezine readers are interested. Contact Darrell directly if you'd like to explore possibilities.

New Projects

This month's new projects from around the Network:

- FMCG – patent design-around project
- SMCG – 21st Century TRIZ workshops
- Tourism – PanSensic project
- Consulting - Design-Thinking & TRIZ Workshops
- Aerospace – IP Workshops
- Manufacture – Process-Breakthrough Workshop
- Fashion – Design-Thinking & TRIZ Deployment
- Textile – Innovation Project
- FMCG – Generations Study