

Systematic Innovation



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Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.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

Right-versus-Right versus Right-versus-Wrong

TRIZ tells us there are three basic kinds of contradiction – technical, physical and administrative. The third of which usually finds itself ignored because it in effect all about those situations where we know what we want, but we don't really know what's preventing us from achieving it. It's a definition that's always felt like a bit of a cop-out to me. Not that the non-TRIZ world does much better. Although at least it offers up a few clues in terms of right-versus-wrong and right-versus-right situations. Contradictions can appear, in other words, if two people have a different opinion about a situation, one of which is a difference built on the fact that one of the two is wrong, and the other – more interesting – where both are right. This right-versus-right situation ('you want equality, I want equity', for example) offers up the biggest opportunity for breakthrough if we're able to somehow break the contradiction. Right-versus-right situations are important enough, I think, to benefit from a more granular definition.

One distinction which seems to be useful is that between the tangible and the intangible (i.e. emotional). Useful in the sense that it's highly plausible that I can be scientifically right about a situation and simultaneously be wrong emotionally (think Richard Dawkins!). Figure 1 is an attempt to describe the four scenarios that emerge when we split the tangible and intangible, right and wrong:

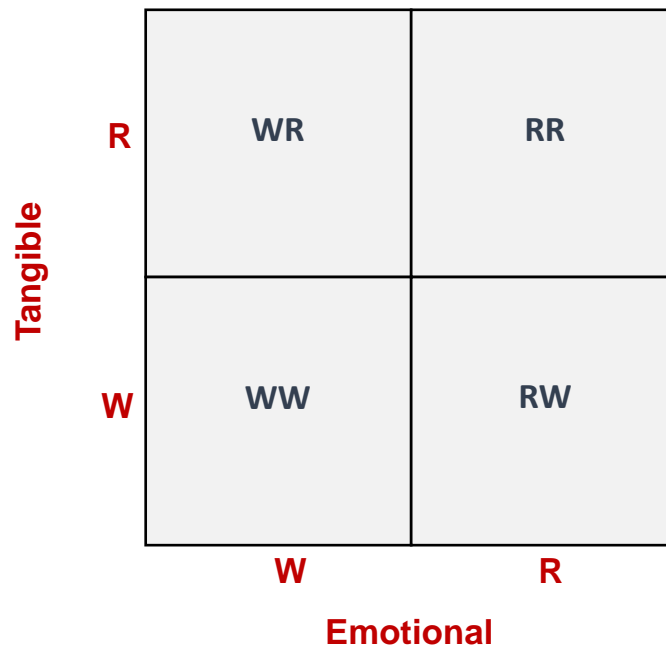


Figure 1: A Tangible/Emotional Right/Wrong Domain Map

Both dimensions are probably best thought of as a continuum. There are degrees of 'right'ness in the same way that there are degrees of 'wrong'ness about a situation. In a scientific sense, we often hear the aphorism, 'all theories are wrong, but some are useful'. In the emotional domain, the distinction between right and wrong is likely even more nebulous. In which case the border between 'right' and 'wrong' drawn onto the figure is perhaps more theoretical than practical. Although, that said, the boundary between the two is often a matter of degree rather than an absolute. Most people, for example, would agree that democracy is 'better' than dictatorship as a form of government, but almost

everyone has a different position along a left/right political spectrum that they would vote for as the 'right' *form* of democracy.

Fortunately, the degree of rightness is not nearly so important an issue as that of identifying and solving contradictions. Arguing about Democrat *or* Republican is ultimately a futile exercise. Treating the Democrat-Republican difference as a contradiction to be solved would be a much more fruitful use of all of our – and our elected politicians' – time.

The Figure 1 domain map, then, offers up a way to help examine different types of contradiction. If we can imagine placing two individuals' points of view 'A' and 'B' about a situation somewhere on the map – as in Figure 2 for example – it ought to be possible to imagine stronger contradiction solution strategies.

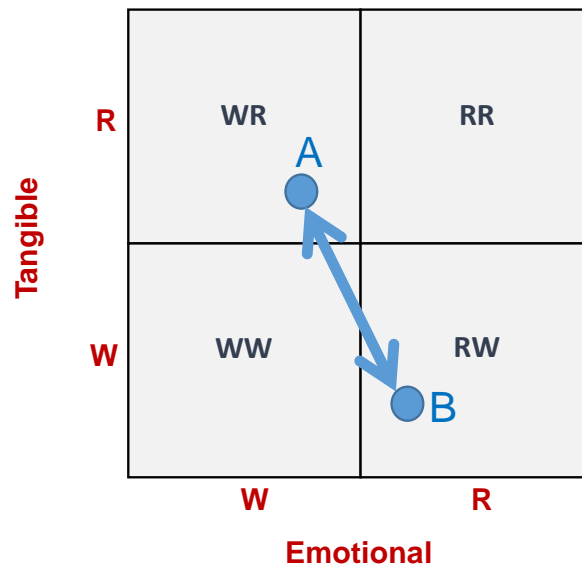


Figure 2: Example A-versus-B Contradiction Scenario

Given the four different quadrants present in the map, and two people, we will find ten different combinations as described in Table 1:

Person A	Person B	Contradiction Type	Comment
RR	RR	Congruent, Transcendent	genuine progress potential
WR	WR	Rational-Scientific ('Autistic')	'technology is ethically and morally neutral'; scientific progress potential
RW	RW	Ideological Dogma	e.g. religion 1 versus religion 2. Emotional understanding/progress potential
WW	WW	Babel	Nonsense-versus-nonsense
RR	WR	Reductive	e.g. physicists looking for theory of everything
RR	RW	Fact-poor	e.g. 'New Age' thinkers with no appreciation of scientific reality versus those with
RR	WW	Banging-Head-Against-Wall	'It is useless to attempt to reason a man out of a thing he was never reasoned into' Swift
WR	RW	Downward Spiral	e.g. Dawkins-versus-religious/spiritual community
WR	WW	Fact/Fiction	e.g. Social Media & 'there are no such things as facts, my opinion is as valid as yours'
RW	WW	Psychiatry	'blind leading the stupid'

Importantly, in only three of the ten combinations is the contradiction between the two people a genuine one, and in only the first case is there an opportunity for genuine, holistic breakthrough solutions to be derived. In the majority of cases, the situation is one of 'right-versus-wrong' and as such the only meaningful way of creating progress is for the two people to correct their collected assortment of errors and mis-conceptions.

In terms of the technically right-versus right contradiction, the technical version of the Contradiction Matrix is the appropriate place to begin solving the differing needs of the two participants. In terms of the emotionally right-versus-right situation, that's where the latest version of the Business Matrix has been designed to operate. Particularly regarding the large increase in awareness of the 'intangible' factors that can very easily come to dominate people and process type contradiction problems. We all want autonomy, belonging and competence, but we also see, I think, that more often than not, one person's ABC is in direct (right-versus-right) conflict with the ABC desires of the person they're talking to.

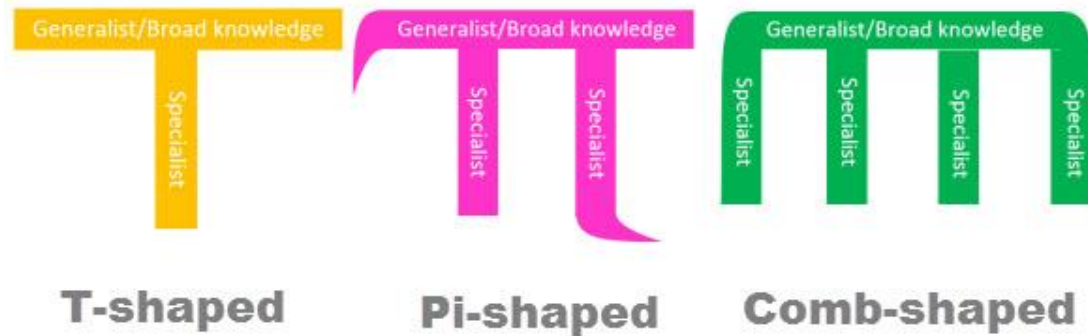
Figure 3 illustrates where the two difference Contradiction Matrix tools are 'best suited'...



Figure 3: Contradiction Types & Contradiction Solving Tools

...this is not to say that either Matrix tool is unsuitable for situations where we have a truly right-versus-right contradiction up in the top-right quadrant of the Figure. More like we need both. Or we find ourselves heading into the realms of trilemma-solving. Which – one day – will be a whole new toolset... same 40 Principles; different way to use them. In the meantime, i know that whenever I find myself in an argument with someone these days, my first mental port of call is to work out where we both are on the right-wrong Domain Map. More often than not, the argument isn't about a true contradiction at all. Which, when I think about it, is scarier than if it was.

#-Shaped People



I was having a discussion the other day about 'T'-shaped and 'pi'-shaped people. Later on, we also discovered there were also 'comb'-shaped people, although I'm not sure how well the metaphorical interpretation works. Maybe 'm'-shaped or 'rake'-shaped would've made more sense. But then, the more I thought about the whole idea of horizontal breadth and vertical depth didn't make sense. Or rather the horizontal part didn't.

I get the vertical idea that as individuals we often choose to specialise in certain domain knowledge areas. I used to know a lot about mathematics, for example, and then later on, I also found myself being called an aerodynamicist. Then I received a Masters degree in 'Gas Turbine Technology' and became responsible for the design of whole engines rather than just the rotating bits. So, I suppose you could say I became 'm'-shaped. Assuming that 'life' was also providing me with a certain degree of horizontal generalist knowledge.

Nowadays, if I'm known for anything it is 'innovation'. I suppose, in theory, this adds a fourth vertical to my 'm'-shaped skillset. But somehow that doesn't feel right to me. Innovation – and especially the TRIZ/SI variant thereof – is by definition about crossing domains. In terms of the vertical/horizontal way of looking at the world, it feels like a horizontal skill more than it does a vertical one.

Innovation is multi-disciplinary and fundamentally demands that I'm able to connect together a number of different domains and disciplines. By the same token, so is 'systems-thinking'. Or cybernetics. Or 'Lean'. Or ecology. In theory, so too are Economics, Politics and Sociology. All of them are fundamentally integrative sciences. That most of them are taught – if they are taught at all as subjects in their own right – as verticals probably helps to explain why Economics and Sociology, to take those two examples, are often known as the 'dismal sciences'. Perhaps the only reason they're dismal is because they're being taught as vertical specialities rather than the horizontal cross-disciplinary subjects they need to be.

The problem, in other words, with the T- or pi- or m- shaped views of the world is that they assume there's only one horizontal subject to counter the myriad verticals. Whether academia recognises it or not, the world contains as many horizontal 'integrative' subjects as it does vertical 'specialist' domains. The only problem is that it's still difficult to go and obtain a qualification in many of the horizontal subjects. Or, as speculated with Economics and Sociology, it's difficult to obtain a meaningful qualification in any horizontal subject that's currently taught as a vertical.

Perhaps it's the same underlying problem we're hearing and seeing in some Western societies at the moment in the growing rejection of 'experts'. If I had to bet my next pay check, I think I'd be willing to speculate that the roots of the criticism are that as a society we have too many *vertical* experts and not enough *horizontal* ones.

I think there's an equivalent problem when I hear physicists (as vertical a discipline as is possible to imagine) speculating about 'Theories Of Everything'. If there ever is such a thing, it will only, I believe, emerge from someone thinking horizontally and not vertically. Or rather 'horizontally and vertically'.

One of Genrich Altshuller's final contributions to the science of innovation was a somewhat flawed piece of work to study the attributes of genius (Reference 1). The basic conclusion – although the authors' never used the expression – was that 'genius' was effectively pi-shaped. More specifically, because I think they assumed everyone possessed a degree of horizontal 'generalist' knowledge, that genius stemmed from having a high degree of depth in two distinctly different vertical domains.

I can certainly see some merit in this view of the world. If I was minded to suggest a better definition of genius, I think I'd be more inclined to describe it as #-shaped. I think that having a detailed vertical knowledge of two distinctly different subjects is a necessary precondition for genius. It's only when these twin knowledge depths have been dived that I believe an individual can even start to begin to recognise that, no matter how far apart the two domains are, there are nevertheless considerable levels of analogical similarity between them.

If two verticals are 'necessary but not sufficient', I believe that the missing pieces in the sufficiency jigsaw are having at least two horizontal expertise's. One of which, I suppose is the generalist knowledge that comes with life's experiences, but the other is an in-depth knowledge of one of the horizontal integrative disciplines... Taught in a truly horizontal manner...

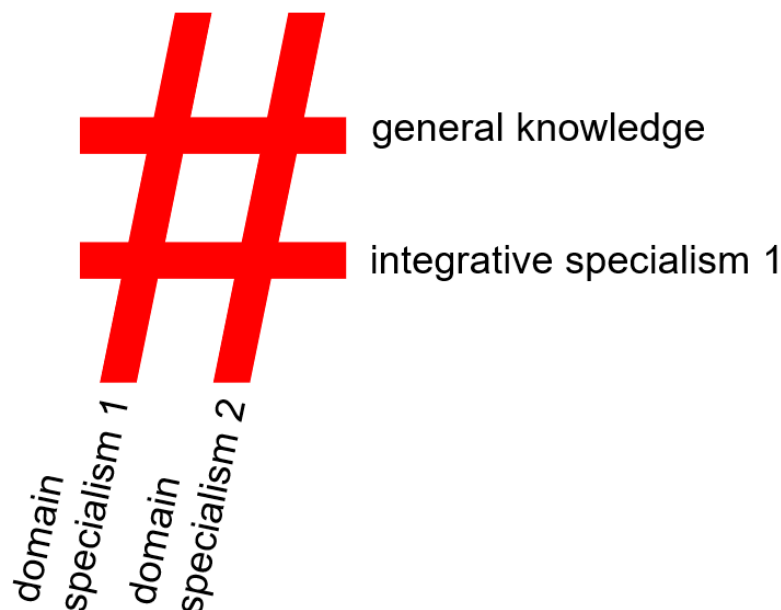


Figure 1: Genius Is #-Shaped

...and, in keeping with Malcolm Gladwell's 10,000 hour hypothesis (whether it's 'right' or not, it's right – Reference 2), that each of the three – one horizontal and two vertical –

specialisms has seen the individual exposed to 10,000 hours of meaningful, stretching, education and practice.

That's my new rule.

Then there's the next one. About how 'lifelong-learning' means adding progressively more horizontals and verticals. Ideally in alternating patterns of horizontal-then-vertical-then-horizontal-again... until we all become (much better metaphor!) potato-masher-shaped...



References

- 1) Altshuller, G.S., Vertkin, I.M., 'How To Become A Genius: workbook for creative personality development', Minsk, Belarus, 1994 (in Russian).
- 2) <http://www.businessinsider.com/malcolm-gladwell-explains-the-10000-hour-rule-2014-6?IR=T>

Not So Funny – Butt-Crack Fashion

Until Generation Y tried to make it into a fashion statement, this was seen as a bad thing:



It now seems the heroic Millennials have learned the error of their ways. Exposed butt-crack is not good after all. And here's how we know:



This is better.

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It looks like classic(al?) TRIZ. It's a contradiction. It's Principle 7. We want to look cool, but when we're standing upright and bending over, there's too much movement to ensure that everything that ought to remain covered remains covered. Something like this:

IMPROVING PARAMETERS YOU HAVE
SELECTED:

Aesthetics/Appearance (39)

WORSENING PARAMETERS YOU HAVE
SELECTED:

Adaptability/Versatility (32)

SUGGESTED INVENTIVE PRINCIPLES:

28, 7, 15, 29, 13, 1, 3, 2

Which, of course, opens up a whole series of other re-design opportunities over and above the Inventive Principle 7, Nested Doll piece of tailoring-genius shown above.

Turns out the fashion industry is ahead of us. Way ahead.

Here's a combination of Principles 1 and 15:



See. No-one's looking at your butt-crack now!

Ditto when it comes to the somewhat less promising sounding Inventive Principle 29, Fluid. Oh, how naïve we can be sometimes...



Problem solved. Clearly, we need to spend more time looking at the fashion industry. Gosh darn it, they even managed to come up with a Principle 28 solution:



Ah, yes, the 'field' always wins in the end. Here's another one. Principle 15 and 28 together, and finally the visible butt-crack problem is solved for good... nice hat...



Patent of the Month – Vortex Generator

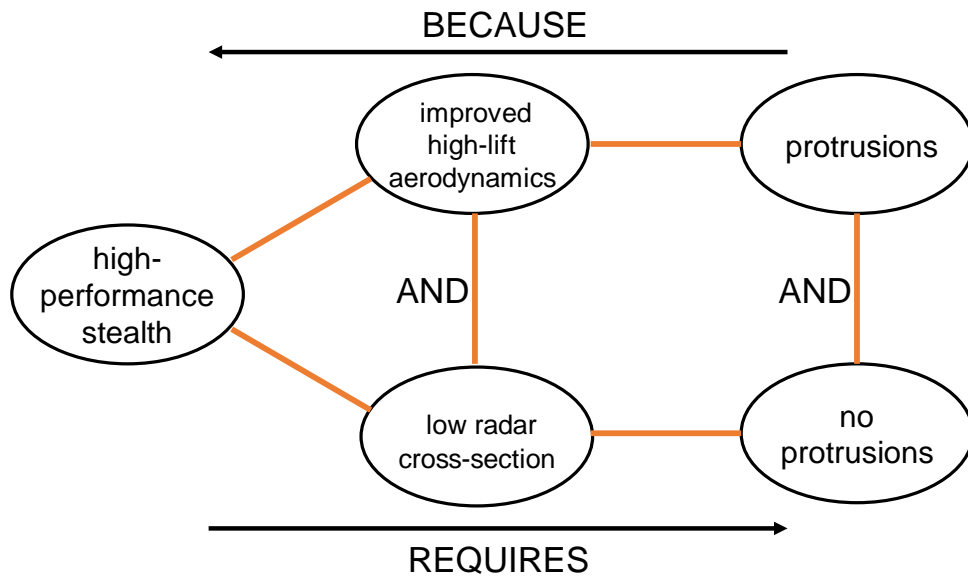


How's this for a classic contradiction. One, it transpires, rapidly approaching it's hundredth birthday...

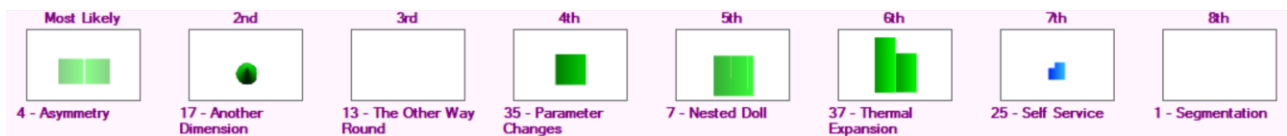
Vortex generators (VGs) come in a wide variety of shapes and sizes, but are used to increase maximum lift coefficients, and/or reattach flows which would separate, and/or smooth unstable flows over lifting surfaces, stabilizers, high lift devices or flight control mechanisms. Some of the first mentions of devices which were intentionally designed to produce aerodynamic vortices were described in the 1930's. U.S. Pat. No. 1,994,045 describes an aircraft with a plurality of ridges in streamwise, spanwise and crosswise directions on wings and aerodynamic lifting surfaces. In normal flight, these forms of ridges set up Gortler vortices which will tend to keep flows attached at the expense of increased overall drag. These same structures were conceived in the Junkers design bureau of Germany in the late 1920's and implemented on a commercial scale on the Ju-52 of 1932. Pletschacher (2002) describes the corrugated Duraluminum skin which added to the comparative structural rigidity of the aircraft with respect to wood and canvas aircraft of the day. Although those early vortex-generating skins performed well in terms of flow attachment, high drag was a hallmark of the design. Accordingly, in 1936, as other design bureaus in Germany experimented with wing skins, it was found that smooth skins had significantly lower drag levels and were therefore preferred for most aircraft flight phases. As the Bayerische Flugzeugwerke Messerschmitt began flight testing of the Bf-110 "Zerstorer," they discovered many aerodynamics challenges as reported by Mankau and Petrick, (2001). To solve some of these issues on the V1 version of the Bf-110 aircraft, several rows of rigid vortex-generating structures were installed on the upper surfaces of the wings. This is often recognized as the first application of separate, independent, replaceable VGs on an aircraft of any class. Although quite effective in delaying flow separation, they possessed one characteristic which would prove fatal in combat in later years: They generated radar cross-section spikes. Because they formed "corner" or "retro" reflectors, they had the tendency to return radar energy to the direction of the transmitting radar. Accordingly, modern stealth aircraft never employ VGs because of the large radar return echoes.

Enter inventor, Ronald Barrett of the University of Kansas, and US9,677,580, granted on June 13, less than a year after initial submission – often an indication of the high level of novelty of the inventive steps.

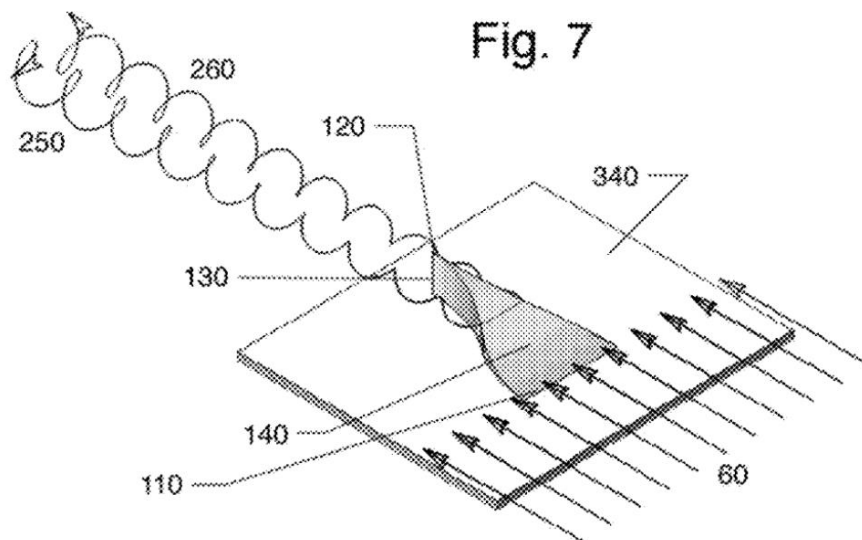
Here's what the contradiction looks like when mapped onto a bubble map:



Here's what happens when we map this into the Matrix+ software bubble-map wizard...



And here's what the new design looks like:



Plenty of Principle 17, 4 and – especially – 13 in evidence there. Then, when we read the words, we also find...

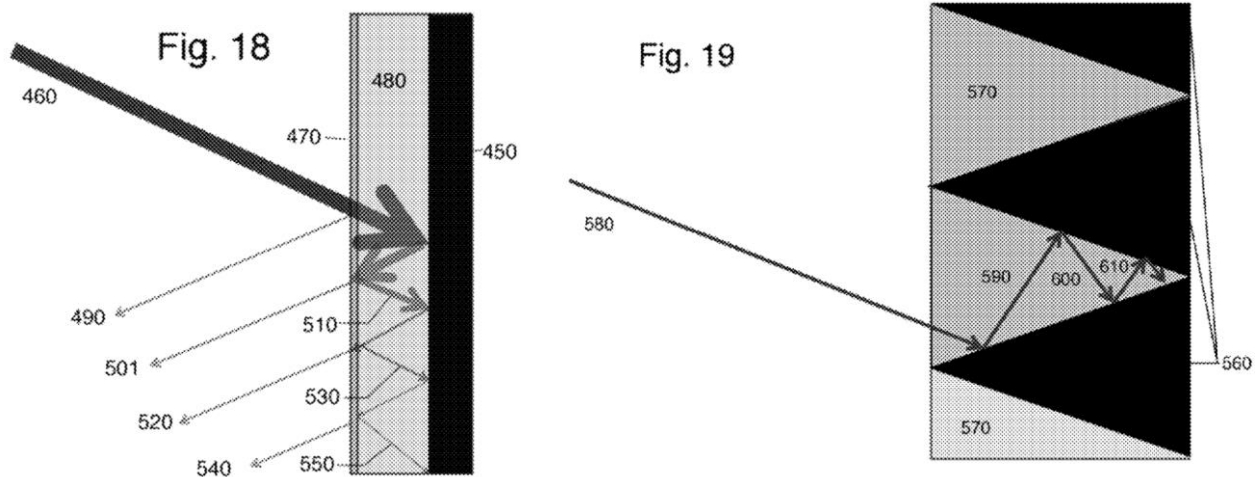
A device which is shaped so as to produce stream-wise vortices when attached to a non-uniform surface exposed to airflow, comprising: a vortex generator having an upstream end and a distal downstream end, where the vortex generator has a lateral width and a vertical height and a (Principle 35) flexible bottom surface configured to mount on the non-uniform surface exposed to airflow where the vertical height of the vortex generator is tapered to increase from the upstream end to the distal downstream end forming a concave upper surface, the concave upper surface having an apex peak at the distal downstream end, and where the lateral width of the vortex generator is tapered to decrease from the upstream end to the distal downstream end forming concave sidewalls; and said vortex generator constructed of a material sufficiently flexible

(Principle 35 again) to deform responsive to increased pressure from a flow field to thereby reduce said vortex generators vertical height at the apex peak from an initial height to a reduced height...

5. The device of claim 1, wherein said material sufficiently flexible to deform responsive to increased pressure is bulk radar-absorbent material (Principle 35, yet again).

6. The device of claim 1, wherein said material sufficiently flexible to deform responsive to increased pressure is (Principle 1) layers of one of radar absorbent and radar-reflective material which form internal Jaumann absorbers...(figure 18)

7. The device of claim 1, having an internal structure comprising radar absorbing and radar reflecting microstructures (Principle 7) forming radio frequency wedge traps... (figure 19):



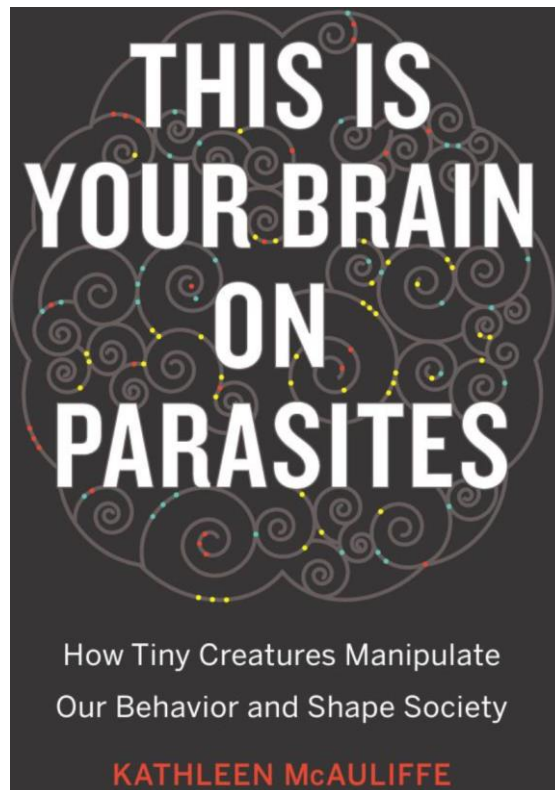
9. The device of claim 1, wherein said material sufficiently flexible to deform responsive to increased pressure is a RADAR absorbing material and internally structurally arranged such that an outermost surface is semi dielectric and an internal portion is constructed of semi conductive material (Principle 37).

And then add...

12. The device of claim 11 where the flexibility of the material is such that the vertical height reduces as a dynamic pressure of the flow field increases (Principle 25).

And it's pretty much a full-house as far as using all of the recommended Inventive Principles is concerned. Almost like a proper case study.

Best of the Month – This Is Your Brain On Parasites



‘Think of someone with a more extreme version of your problem, and they’re very likely to have already found a solution’. An aphorism anyone in the TRIZ/SI world finds themselves using a lot. This month’s book choice is about a whole series of such extremes. The world of the parasite is rarely an easy one. Entering a host most likely sets up a win-lose battle in which either the host or the parasite is likely to end up dead. The host’s immune system tries to repel the parasite; the parasite knows that if they kill the host, they’re going to have to go and find another one. In a win-win world, the host invites the parasite in and both end up better off. Like the 90% of our bodies that are made up of ‘good-parasites’...

...or, are they good? Is the ‘win-win’ actually biased in favour of the parasite? This is one of the compelling hypotheses of ‘This Is Your Brain On Parasites’, an eminently readable piece of meta-research by journalist, Kathleen McAuliffe. If some of the parasites in my digestive system develop a liking for junk-food, it is in their evolutionary interests to encourage me to go and eat more junk food. So – maybe – that’s what they’ve evolved to do? Parasites 1, Darrell’s waist-line 0.

Emphasis, fortunately, is on the word ‘maybe’, for one of the things McAuliffe finds herself battling is the academic community, many of whom refuse to accept that host behavior is subject to influence by the parasites they contain. Do we cough to get rid of cold viruses, for example, or because the cold virus ‘instructs’ us to cough so they have a better chance of spreading to other hosts? It’s an interesting debate, but one that ultimately, I think McAuliffe understands better than the academics who argue in favour of the (pathological) host – check out the stuffy New Scientist ‘shaky science’ review for a classic piece of either-or/miss-the-point thinking. The real point isn’t about which solution is right, but that the host/parasite relationship has developed in such a way that both are looking to

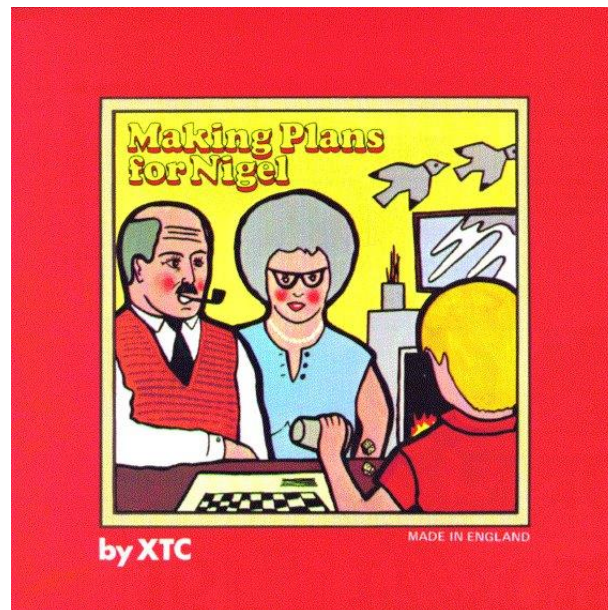
achieve a win. And as such, many of the amazing stories in the book represent classic examples of how evolution can often throw up some frankly amazing innovations. Like, for example, the parasite that can only breed inside cats has opted to invade rodent brains to encourage them to be attracted to cats, and hence be more likely to become cat-chow. Okay, not such a 'win' for the rodents in question, but nevertheless an amazing piece of evolutionary ingenuity... in which the rodent is merely Inventive Principle 24 in the bigger picture contradiction solution.

Parasitology, according to McAuliffe, has long been an orphan subject, and society as a whole has suffered as a consequence. If we understood how 'our' parasites work, we might have a much better chance of solving the world's ongoing obesity and allergy epidemics. And why populations occasionally vote for politicians that if our rational-brains were in charge (as opposed to the parasites) we might more sensibly avoid.

I don't believe all of it, but that's probably not the point. The points are that a) McAuliffe knows how to write a great, highly readable story, b) parasites are terrific contradiction solvers, and, c) in every chapter, the reader is prompted to challenge a host of pretty fundamental assumptions about how the world really works. Provocative. Lovely.



Wow In Music – Making Plans For Nigel



1979 was a pretty revolutionary year for me in terms of music. Punk had destroyed the credibility of just about every professional musician in my first love Prog Rock. The kings were dead, long live the king. Not being able to play your instrument was the new thing. For a while at least. Punk quickly evolved into 'New Wave' and New Wave in turn quickly spawned Power Pop. Enter XTC. A Swindon four-piece that would come to be revered as one of the finest British bands of all time. By a very small group of in-the-know fans that is. Like the Beatles with the hooks turned up to eleven and the fan-base turned down to 0.1. I fell in love with their debut single, Statue Of Liberty (especially after it got banned on the radio), but I fell in love with the group when they released the 'Making Plans For Nigel'.

Right from the opening, you knew something different was happening. Admittedly it took me a while to work out what it was, but that wasn't really the point. The song, a social commentary on British life and the pressures being placed on a shy little boy by his family, is introduced by a complex drum pattern from Terry Chambers in which he "played the odd combination of hi-hat, bass drums and tom-toms in reverse, the result of his misinterpretation of instructions from the perennial auteur and erstwhile band-leader Andy Partridge. The upshot was a (Principle 13) backward-sounding drum pattern that propelled the chiming crunch of the guitar chords, backing the suspicious claims that "we only want what's best for him" and "he only needs this helping hand." Listen to the opening today – nearly 40 years later – and the mighty Chambers rhythm still thrills. The treated sound, by Steve Lilywhite to give it a space-age resonance, rumbles almost musically around the available space from the floor tom through the mounted toms, a luxuriously sucked hi-hat attracting attention away from the featherlight snare. It's BIG without being caps-lock.

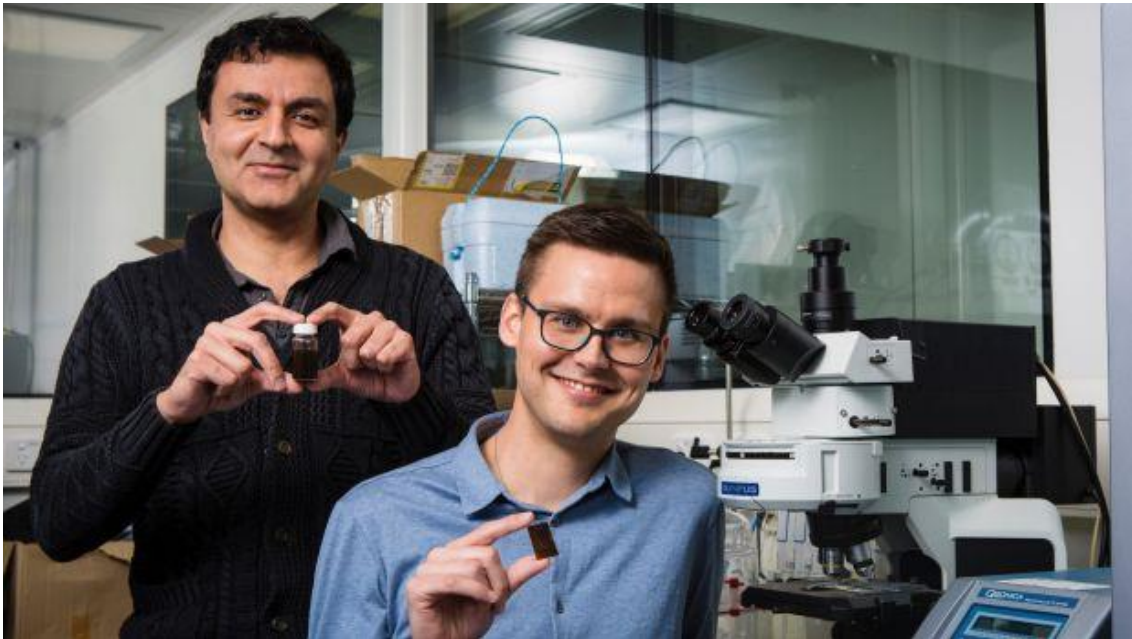
According to Partridge, people still come up to him to comment on the rhythm and how inventive it was. But, he replies, 'it's just a normal pattern played on the wrong drums.' Ironically, Partridge didn't write the song or the rhythm part, that honour goes to right-hand-man, Colin Moulding. 'I've got to say I was lividly jealous of [Colin] at that point because he just couldn't put a foot wrong.'

The Principle 13 theme continues beyond the opening bars too, with the bouncy guitar rhythms and the forced-smile sounding vocals provide an eerie counterpoint to the tension produced from the drum parts.

The opening is still great, as is the (Principle 17) bridge, the (Principle 3) pre-chorus and the chorus itself, but I think the reason I still listen to the track (a lot) is the final addictive spark of genius that occurs after 3 minutes, 35 seconds, where we hear a final repeat of the 'his whole future's in British Steel'. Only this time, the guitar backing disappears (Principle 2), and the word 'steel' gets a (Principle 26) dub-style echo repeat wailing chant that makes the heart swell. I've heard it a million times and it still catches me every time. I think half the reason I keep playing the song, in fact, is so I can hear that 3 minute 35 second section over and over again.

Still one of XTC's best loved tracks, "Making Plans for Nigel", the song establishes itself as a truly original, masterful track, one that still finds its way into many critics list of best singles of all time. Listen up here... <https://www.youtube.com/watch?v=9Gf9kyG1jVI>

Investments – Solar Paint



Researchers have developed a solar paint that can absorb water vapour and split it to generate hydrogen – the cleanest source of energy.

The paint contains a newly developed compound that acts like silica gel, which is used in sachets to absorb moisture and keep food, medicines and electronics fresh and dry.

But unlike silica gel, the new material, synthetic molybdenum-sulphide, also acts as a semi-conductor and catalyses the splitting of water molecules into hydrogen and oxygen.

Lead researcher Dr Torben Daeneke, from RMIT University in Melbourne, Australia, said: "We found that mixing the compound with titanium oxide particles leads to a sunlight-absorbing paint that produces hydrogen fuel from solar energy and moist air.

"Titanium oxide is the white pigment that is already commonly used in wall paint, meaning that the simple addition of the new material can convert a brick wall into energy harvesting and fuel production real estate.

"Our new development has a big range of advantages," he said. "There's no need for clean or filtered water to feed the system. Any place that has water vapour in the air, even remote areas far from water, can produce fuel."

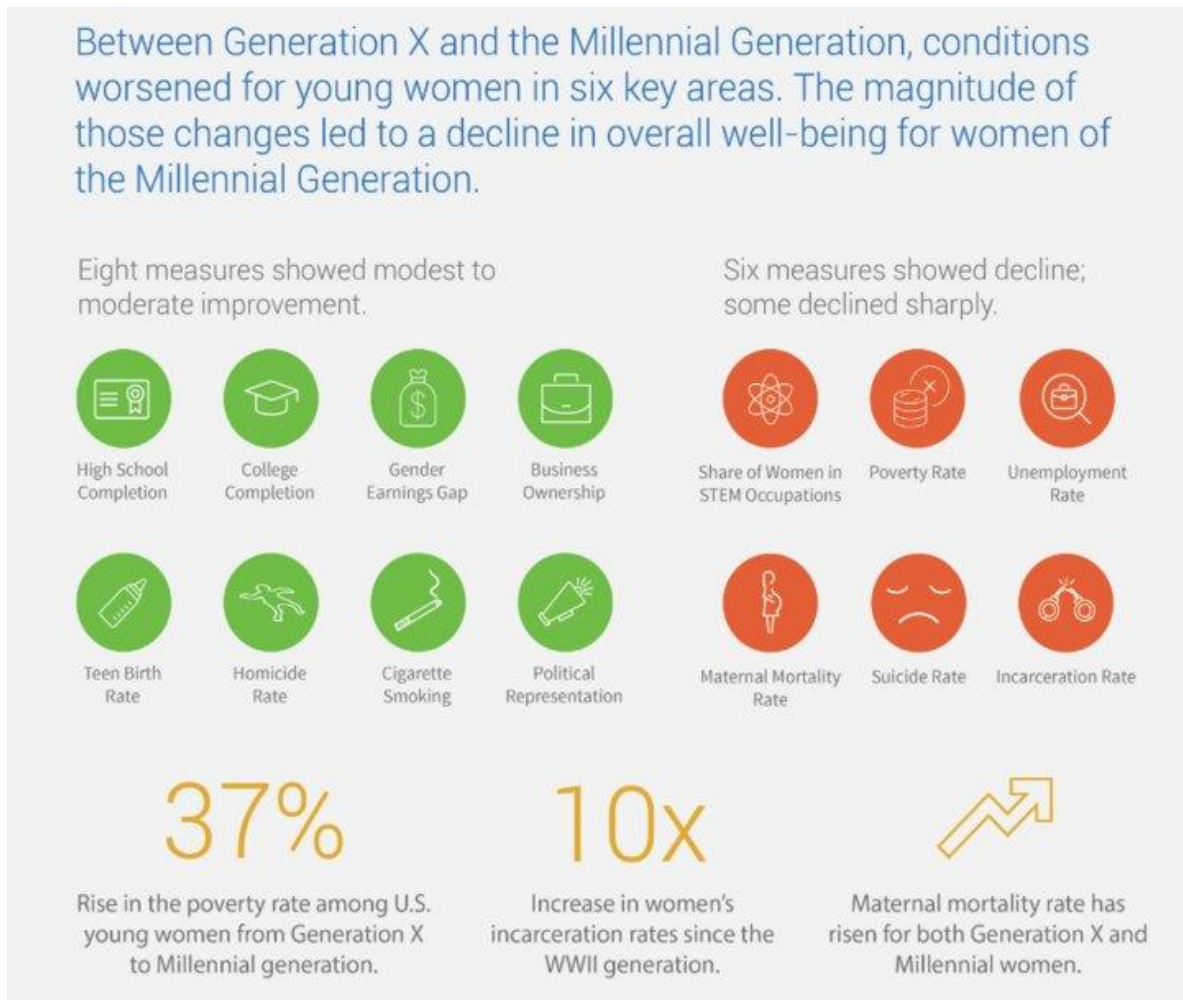
His colleague, Distinguished Professor Kourosh Kalantar-zadeh, said hydrogen was the cleanest source of energy and could be used in fuel cells as well as conventional combustion engines as an alternative to fossil fuels.

"This system can also be used in very dry but hot climates near oceans. The sea water is evaporated by the hot sunlight and the vapour can then be absorbed to produce fuel.

"This is an extraordinary concept -- making fuel from the sun and water vapour in the air."

Watch the video: <https://youtu.be/Ci6LKz0ajfI>

Generational Cycles – Millennial Women – Crisis? What Crisis?



Young American women are poorer than their mothers and grandmothers were when they were young, more likely to commit suicide and be shut out of high-paying tech jobs — an overall demise in well-being since the baby boom generation.

Those are the findings in a new report by the Population Reference Bureau, a nonprofit that looks at population and other development issues. It found that social and structural barriers continue to obstruct the advancement of female members of Generation X and millennials.

For experts working on women's issues, the report's conclusions came as no surprise. "We have been pushed back, there's no question," said Terry O'Neill, president of the National Organization for Women. "Younger women are really feeling the effects of ... a 30-year march to dismantle government agencies, to dismantle government protections, all in the name of free markets."

The report used 14 measures to assess "well-being" — such as earning capacity, education and health — to calculate the magnitude of the change between the status of young women today relative to women in their mothers' and grandmothers' generations when they were the same age.

“We expected to see that there would be certain subgroups of women that would be doing much worse than others, but we were surprised to find that women overall were doing worse than the previous generation,” said Mark Mather, associate vice president of U.S. programs at Population Reference Bureau and co-author of the report.

Members of the baby boom generation, who were born between 1946 and 1964, saw their well-being increase by 66 percent over their World War II counterparts, but the improvements did not continue for Generation X women, born between 1965 and 1981. They experienced a 2 percent gain in well-being relative to the baby boomers, while millennial women, born between 1982 and 2002, experienced a 1 percent decline in well-being, according to the report.

Improvements in young women’s economic security began to stagnate during the mid-1990s, and their struggles have continued into the millennial generation, particularly among women without college degrees, the report said.

In addition to health, education and earning capacity, the Population Reference Bureau considered other measures of well-being, including teen birth and maternal mortality rates, the prevalence of cigarette smoking and incarceration rate.

The eroding social safety net, violence against women, unequal pay — the Bureau of Labor Statistics put the median weekly earnings of full-time working men at \$895 in 2015 compared to \$726 for women — were other factors hindering the overall well-being of young women, according to the report.

The report found that the proportion of women aged 30 to 34 years old living in poverty had increased to around 17 percent for the millennial generation, up from 12 percent for Generation X females. While Generation X women comprised 1 in 4 workers in high-paying STEM occupations, the statistic dropped to 1 in 5 for millennial females, according to the report.

Download the full report here:

http://www.prb.org/pdf17/17-211%20PopulationBulletin72-1_2017-06-12-1704_FINAL.pdf

Biology – Cope's Gray Tree Frog



You've been there: Trying to carry on a conversation in a room so noisy that the background chatter threatens to drown out the words you hear. Yet somehow your auditory system is able to home in on the message being conveyed by the person you're talking with. The secret to rising above the noise – a dilemma known in the world of sound science as "the cocktail party problem" – turns out to lie in its ability to discern patterns in the background noise and selectively ignore such patterns, according to a new study published in this month's *Current Biology*.

Listening to a deafening chorus of Cope's gray treefrogs on a spring evening, scientists have wondered: Do female frogs use a similar strategy to pick important messages about potential mates out of the cacophony? The chorus consists of the calls of countless individual male frogs, each of which is conveying information about which species it is and how fit it is – with faster, longer calls indicating fitter individuals. To ensure the best survival of their young, "the females have to be able to tell the appropriate species and be able to choose a high-quality male," says Norman Lee, a postdoctoral fellow in the Department of Ecology, Evolution, and Behavior. But how can they, when everyone is talking at the same time?

Working with associate professor Mark Bee and colleagues in EEB and the Department of Psychology, Lee has figured out what traits of the background noise of frog choruses allow females to tune out the hubbub and tune into the hubba-hubba – with implications not only for our understanding of frog ecology and evolution, but also for our ability to help humans hear.

Lee knew from others' research that humans are able to hear certain sounds better in noisy settings when the background noise is (Principle 5) "comodulated" – meaning that the various frequencies of sound it comprises vary in loudness together. Could the fact that the background noise is comodulated be a key to the frogs' success? To find out, he first built a model of the Cope's gray treefrog's ear and used it to determine how this

species may process the background chorus. He then analyzed frog choruses and discovered that the chorus input indeed is comodulated.

"What we [still] didn't know is if animals could exploit these features for improved decision-making," Lee says. To answer that question, he produced several artificial choruses made up of two noise bands centered on the call frequencies – one in which the sound was unmodulated, meaning that it didn't vary in sound intensity; one in which the two noise bands were modulated but not together; and one in which the two noise bands were comodulated. He then played each of those in the background while presenting females with a Cope's gray treefrog call and a call simulating another species. Indeed, the females were most likely to choose the right species' call when the background noise was comodulated. Similarly, he presented two Cope's gray treefrog calls, with one being longer and repeated at a higher call rate (and so, presumably representing a more fit mate and therefore a better evolutionary choice). He found, again, that females made the best choices when the background chorus was comodulated.

"Previous studies of animal communication have generally regarded noise as a relatively static feature of the animal's acoustic environment," says Bee. "What this new work shows is not only that noisy acoustic scenes are, in fact, dynamic, but also that they are dynamic in predictable ways that animals have evolved to exploit to avoid noise-induced errors in communication."

Because frogs' ears are configured differently than those of other vertebrates and so may process sound differently, the findings hold importance not only for understanding what it takes for frogs to successfully procreate, but also for humans: Knowledge of the differences, the researchers say, could potentially be used to design better hearing aids and speech recognition systems. Trying to carry on a conversation in a room so noisy that the background chatter threatens to drown out the words you hear. That's the core challenge. Here's what it looks like when mapped on to the Contradiction Matrix:

IMPROVING PARAMETERS YOU HAVE
SELECTED:

Ability to Detect/Measure (49)

WORSENING PARAMETERS YOU HAVE
SELECTED:

Noise (29) and
Trainability/Operability/Controllability (34)
and System Complexity (45)

SUGGESTED INVENTIVE PRINCIPLES:

25, 37, 3, 15, 2, 28, 5, 13, 18, 10, 9, 23,
35, 4, 7, 24, 32

Solution-wise, the secret to rising above the noise is the aforementioned 'comodulation' – the ability to discern patterns in the background noise and (Principle 2) selectively ignore such patterns. Which looks pretty similar to what the Matrix would tell us to do.

Read more:

Norman Lee, Jessica L. Ward, Alejandro Vélez, Christophe Micheyl, Mark A. Bee. **Frogs Exploit Statistical Regularities in Noisy Acoustic Scenes to Solve Cocktail-Party-like Problems.** *Current Biology*, 2017; 27 (5): 743 DOI: [10.1016/j.cub.2017.01.031](https://doi.org/10.1016/j.cub.2017.01.031)

Short Thort

*“The journey of reinvention is one of raw emotions
Emerging from dormancy
Surprising as a paper cut
Overwhelming as a hailstorm
One part vulnerability
One part rage
One part surrender
Uncomfortable
Unfamiliar
Unsure
Fearful
Alone
Damaged
Broken
And finding a new Self
Slowly
Different
Healing
Humble
Present
Open
Longing
Free”
Dave Rudbarg*



*“In order to win you must be prepared to lose sometime.
And leave one or two cards showing.”
Van Morrison*

News

Buckingham Open Day

Short notice, but if anyone is close by Buckingham on 5 July, we're having an Open Day to introduce alumni and the world at large to the new Innovation MSc programme.

Lean Enterprise – Foundations, Standardization & Disruption

Speaking of Buckingham, Darrell will be contributing a day on Disruption during the Lean Enterprise short course scheduled to take place during the week 18-22 September. More details and booking at the BLEU webpage - <https://www.buckingham.ac.uk/event/lean-enterprise-foundations-standardization-disruption/>

US

Looks like Darrell will be back in the US from 1-11 August. Most of the days are already committed to client jobs in Minneapolis and Orlando, but there are a potentially a couple of available days if anyone wants him to come and do something. Getting in touch directly is probably the best strategy.

HOSI Re-Print

The new batch of reprints of the Technical edition of HOSI have finally arrived. Apologies to those people frustrated when we were forced to remove the book from the website... interesting to note how the price on Amazon went up during the time the book was unavailable... not that we sell through Amazon!

Books

Speaking of books, Darrell is instructed to lock himself in a darkened room for the second half of August to finish up at least two long-overdue manuscripts. The final-final edit of Business Matrix 3.0 and GenerationDNA are the top two items on the list.

New Projects

This month's new projects from around the Network:

- IT – System-Coaching Mentoring Programme
- Automotive – SI Certification Workshops
- Electronics – Patent Bulletproofing workshop
- Tourism – PanSensic Study
- FMCG – SI Workshops
- Education – Leadership Innovation Workshop
- Industrial – SI Workshops
- Education – Entrepreneurship Education module development
- HR – Recruitment Strategy Project
- IT – Design-Thinking Workshop