Systematic Innovation

e-zine

Issue 194, May 2018

In this month's issue:

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

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.

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

Case Study: Patient Compliance Big Picture

We first wrote about patient compliance via a very specific case study some time ago (Reference 1). Reading Jordan Peterson's book, '12 Rules For Life' (Reference 2), recently triggered thoughts about the bigger compliance issue. Specifically, his second Rule, 'Treat yourself like someone you are responsible for helping', which begins with the apparent paradox that a patient who has just received a kidney transplant and needs to take drugs to ensure his body doesn't reject the new organ is less likely to comply with his medication than he would be to comply with the medication prescribed by his vet for his sick dog. Peterson's overall conclusion is that we tend to possess a hidden belief that 'we're not worthy' of being saved. To be honest, the conclusion felt somewhat counter-intuitive. Counter-intuitive enough for us to instigate a piece of research of our own.

Lots of smarter people than us have, over the years, done analyses to try and get to the 'root cause' of patient non-compliance. The reason the compliance problem feels no closer to being solved today than it was when medicines first appeared in the world, is probably because all these smart people – Peterson included – operate from the mis-conception that any kind of complex problem can have a 'root cause'. As we've been saying for many years now, there is no such thing as a root cause when the problem is complex. Rather, the problem may be seen to be an emergent property of a conspiracy of causes.

We decided to make a trawl through the literature to find as many 'root cause' definitions as we could. We ended up with 57. The results of the findings are summarized in Figure 1:

Identifier	Perception Description
1	Stigma of taking meds (mental health)
2	fear about long-term effects (e.g. Statins)
3	reluctant to be on meds for rest of life
4	frustration trying different meds before finding one that works
5	fear of building drug resistance
6	trial & error, nothing works, get fed-up and seek alternative therapies
7	disbelief that it is working
8	difficulty with complex medication schedules
9	not able to drink alcohol
10	belief thatimmune system works 'on its own'; meds only if life-or-death
11	physical impairments (eg artthritis) prevent ability to open containers
12	rising medication costs
13	parents don't like keeping kids on meds long-term
14	taking pills reminds me 'i'm sick' and i'm not a pill-person
15	medication = chemicals = unnatural (societal trend towards 'natural')
16	don't have symptoms
17	fear of potential side-effects (not actual ones)
18	particular conditions have very expensive drug regimes (expense/guilt)
19	scary and severe side-effects
20	fear of losing 'self' (eg medication for bipolar)
21	fear of dependence
22	if doctor doesn't mention, it must not be important
23	forgot a dose
24	deliberately skipping doses (e.g. 'pparty tonight')
25	'therapy holiday' - want to take a break from treatment
26	stopping therapy
27	feeling too sick or unwell to take medication
28	lazy about going to pharmacy
29	too busy
30	life events 'stress'
31	confused about dosage
32	side-effects outweigh benefits of treatment
33	stop treatment to check if illness is still present
34	patients forget what doctors tell them
35	information overload - patients only absorb familiar information
36	lack of knowledge
37	denial or trivialisation of symptoms
38	perceived invulnerability
39	lack of confidence in doctor/pharmacist
40	scare stories on internet
41	inconsistent advice from different professionals
42	distractions @ appointed medication time
43	constant medication regime versus changing daily schedules
44	don't like 'the drug' being in control
45	missed a dose and it didn't seem to have adverse effect
46	adverse effects of multiple medications (drug-interaction)
47	i don't want to be member of 'sick tribe'
48	don't take at prescribed times
49	medication treats symptoms not causes
50	guilt
51	'back to square one'/no sense of progress
52	not my fault/don't want to take responsibility for health
53	i experiment
54	inconsistent after-effects
55	no sense of progress
56	I'm not worthy (Jordan Peterson, Rule 2)
57	seek easy diversions

Figure 1: List Of Reasons Patients Give For Not Complying With Medication Regimes

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After uncovering the 57 unique explanations for the non-compliance problem, fairly obviously, our next step was to construct a Perception Map in order to better understand the relationships between each of them.

The resulting map indicated three independent themes. The first, and biggest of these themes is illustrated in Figure 2:

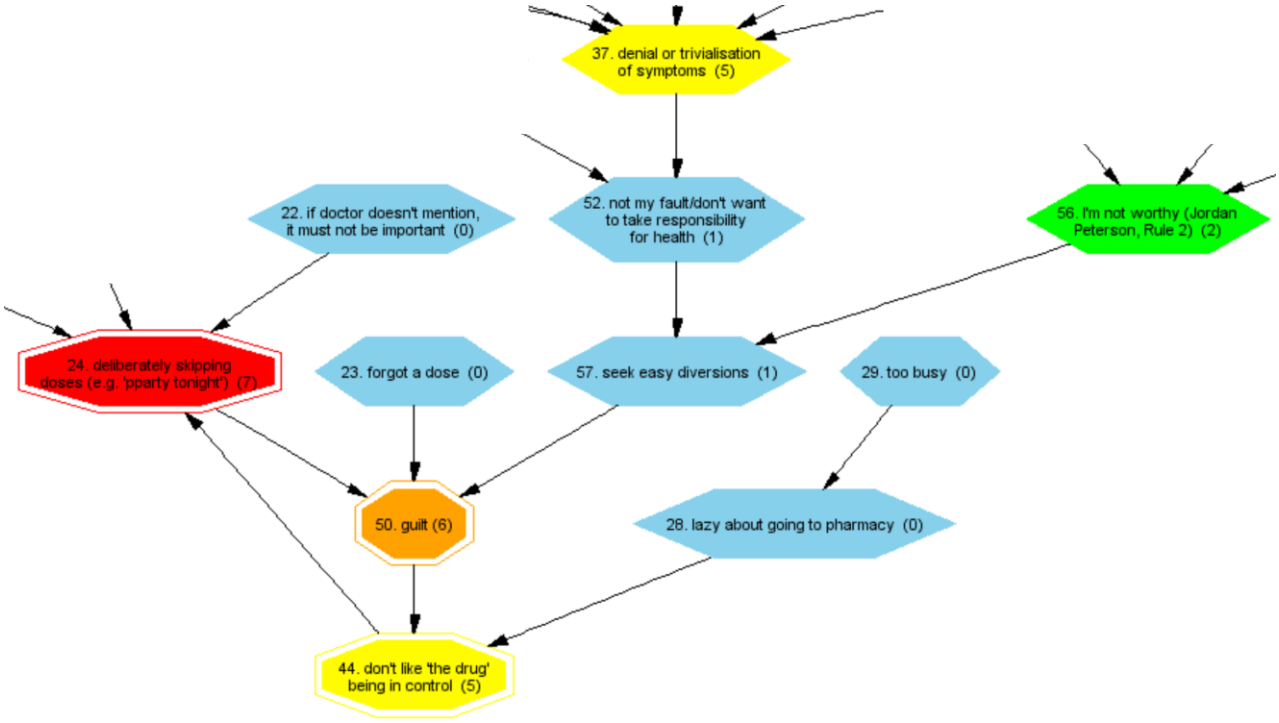

Figure 2: Patient Non-Compliance Loop 1 – Control/Guilt

The downward-spiral representing loop illustrated in this map is all about our inborn desire to be 'in control', leading to occasional compliance lapses, which in turn lead to guilt and then back to a bigger reminder of the feeling of not being in control. Interesting, too, to see the Jordan Peterson Rule-2 as one of the two drivers of guilt, the other – bigger – driver being denial or trivialization of symptoms.

All in all, it is difficult to see much evidence within the overall healthcare sector that anyone is seriously tackling these issues. Especially in light of the fact that when any of us steps over the threshold of any kind of medical facility, we inherently put ourselves under the control of others. It is not our intention to trivialize the problem here with glib answers – this is a big systemic issue that feels like it needs a portfolio of contradiction-breaking solutions. That said, it seems like the Perception Map hints that Peterson's Rule 2 suggestions offer up a solution means suitable at the individual level… provided the patient is prepared to be honest with themselves about their symptoms.

Moving on, the fact that the map reveals second and third independent themes should tell us that Peterson's 'root-cause' diagnosis might well be 'necessary', but that it can't be 'sufficient'. Figure 2 shows the second theme – this time a downward spiral loop relating to patient fears of addiction and diminishing drug efficacy the more the duration of usage is maintained.

This is another enormous issue. For the pharmaceutical industries at least, who, it may be seen have something of a vested interest in preserving this downward spiral, since, for them, it can easily look like a very virtuous-cycle means of continuing to sell lots of drugs.

There's not much that an individual patient can do to mitigate this downward spiral. Its presence in the map seems indicative that people publishing their thoughts on the compliance problem have tapped in to something that people – in the West at least – kind of instinctively know: taking drugs means we are tampering with the human body's natural 'self-organising' capabilities.

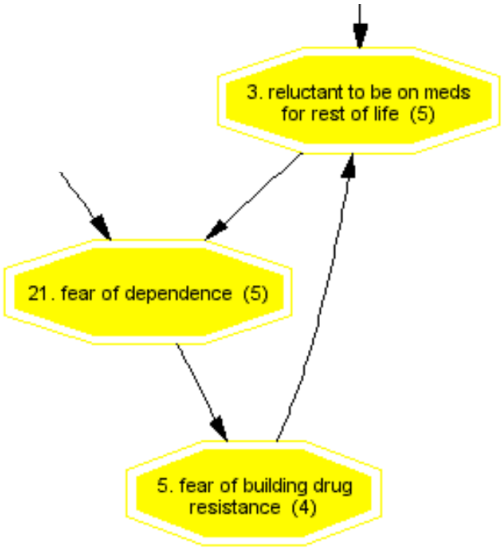

Figure 3: Patient Non-Compliance Loop 2 – Addiction/Diminishing-Returns

We get to see another version of this 'tampering' problem in the third Map theme, as illustrated in Figure 3:

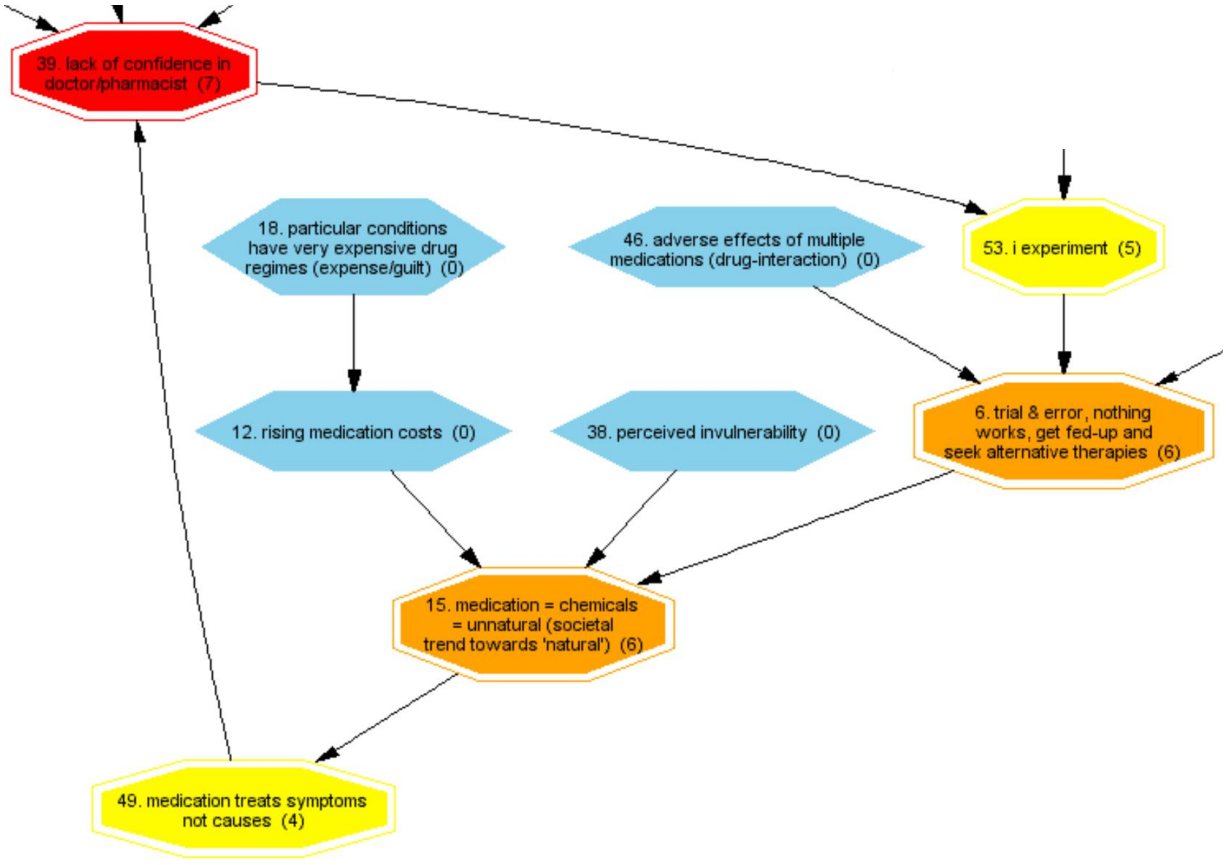

Figure 4: Patient Non-Compliance Loop 3 – Guessing/Non-Holistic

This downward-spiral representing loop is the most complicated of the three. Looking at the sequence of five perceptions in the loop reveals the story of a growing awareness that 'modern' (Western) medicine is very symptom-focused and thus, thanks to the Internet and the propensity to use it as a first port of call, and the likelihood that we will find multiple conflicting remedy suggestions leads to a lack of confidence in doctors. Which then, in turn, leads to patients increasingly likely to experiment, which then leads to a broader range of alternative therapies being tried, which then leads to the aforementioned growing awareness that treating symptoms rather than causes is not a good thing.

This is perhaps the most pernicious of the three themes, suggesting as it does, that the whole medical (Western – again) profession is in need of a major step-change. A step-change that necessitates a root-and-branch re-invention of the whole system, starting with the ways in which new doctors are educated. The healthcare sector is structured around a suite of specialties, few of which ever get to interact with the others, and as a result, the patient never gets to receive treatment (or preventative advice for that matter) in which all or even some of the dots are connected.

So What?

While anyone in the SI team is taught and believes that 'all problems are solvable', we also know that the constraints that get imposed on problems can also very easily make them unsolvable. Patient compliance, in other words, is a very solvable problem. Provided the whole healthcare domain works together to solve it. And therein lies the rub – the healthcare domain not only doesn't work together, it currently has no incentive whatsoever to learn how to work together. Specialists educate more specialists; drug companies need to keep selling drugs to stay in business. And meanwhile, you and I, the poor patient is caught in a psychological guilt trap.

What the three themes says to us here in SI-Land is that all attempts by the healthcare 'system' to solve the patient-compliance problem are doomed to failure until such times as the 'system' is willing and able to re-invent itself. That's a Level 5 Innovation Capability Maturity job. Sadly, there are no players in the healthcare sector with anything better than Level 2 capabilities at the moment.

Which leaves major disruption from outside the 'traditional' boundaries of the current system as the most likely hope.

While there are some signs that this (AI-driven) disruption is on the way, it doesn't offer up much hope for today's patients and their struggle to comply with the medications they're having prescribed. For individuals to battle the 'system' single-handed is a pretty big ask. From my perspective, the most pragmatic advice seems like it comes from the growing AntiFragile movement (Reference 3): prevention is better than cure, and the best way to prevent is to periodically stress the body to trigger the self-repair mechanisms it possesses. Then, if we do reach the symptomatic stage of an illness and things are serious, eliminate feelings of guilt, and attack the problem with as many strategies as you can.

References

1) Systematic Innovation E-Zine, 'Case Studies: Patient Compliance Improvement', Issue 147, June 2014.
2) Peterson, J.B., '12 Rules For Life: An Antidote To Chaos', Allen Lane, 2018.
3) Taleb, N.N., 'Antifragile: Things That Gain From Disorder', Penguin Random House, 2012.

DSRP v LoSC

A good friend told me I had to take a look at Derek & Laura Cabrera's book, 'Systems Thinking Made Simple' (Reference 1) a few weeks ago. My intrigue was brought to a critical level when I saw that the Distinctions-Systems-Relationships-Perspectives (DSRP) core of the book didn't appear to tally with the TRIZ Law of System Completeness. It was a classic Niels Bohr, 'How wonderful that we have met with a paradox. Now we have some hope of making progress' moment. At least in theory it was.

Apparently, the Cabrera's are causing some big waves in the Systems Thinking world. What was not to like? Well, quite a lot as it turns out. Especially since the book was 'not cheap'. I started to get a tad resentful about my investment within the first forty pages. I understand it's important to set the context for what's coming and to explain the problem that needs to be solved, but when that part ends up taking up over half the book, I start to get suspicious. This gets compounded when I then start to read critiques of other tools and methods (Mind-Maps, Network Analysis) where neither Derek nor Laura appears to understand what any of them were actually designed to do. DSRP, Mr and Mrs Cabrera, is only 'better' than other tools, methods or strategies when we understand what we're trying to achieve. When I know that the main job of Mindmapping is to help me organize structure on a specific topic, I know I definitely don't gain any benefit at all by re-drawing it in the Cabrera's alternative form. What they're asking me to do looks rather like crackpot rigour to me. As does an awful lot of the book. In the end, I get the impression that the Cabrera's fall into the same category as much of the Big Data Analytics world: they're passionate people that want to save the planet, but have never had to solve a real problem in their life before and hence have no idea beyond abstract theory about what is useful and what isn't. It is very noticeable that the Systems Thinking Made Simple book doesn't contain a single case study example of anything.

I get that the Cabrera's want to 'help the world' by creating a population that is better at systems thinking, but I suspect too, that if they'd deemed to follow their own medicine and looked beyond their own navel-gazing perspective, they might have seen that TRIZ does everything they're trying to do and more.

I could go on, but there's no real point in attacking bad thinking. The only useful bit comes when we look for the things that might have some value. Which then brings us back to the overall question of how the DSRP model apparently conflicts with the Law of System Completeness.

First up, a few context-setting quotes from Systems Thinking Made Simple:

"System Thinking is not a process but an outcome."

"System Thinking is an emergent property of a [complex adaptive] system."

"Distinction Rule: Any idea or thing can be distinguished from the other ideas or things it is with."

"Any boundary we make is a distinction between two fundamentally important elements: the *thing* (what is inside), and the *other* (what is outside)."

“Systems Rule: Any idea or thing can be split into parts or lumped into a whole.”
“Systems thinking is a particular type of metacognition that focuses on and attempts to reconcile the mismatch between one’s mental models and how the real world works.”

“Relationships Rule: Any idea or thing can relate to other things or ideas.”

“Action-reaction relationships are not merely important to understanding physical systems, but are an essential meta-cognitive trait for understanding human social dynamics and the essential interplay between our thoughts (cognition), feelings (emotion), and motivations (conation).”

“Perspectives Rule: Any thing or idea can be the point or the view of a perspective.”

“…perspectives are synonymous with a ‘point-of-view.’ Being aware of the perspective we take (and equally important, do not take) is paramount to deeply understanding ourselves and the world around us.”

So, what to take from this?

Well, the first thing, I think, is that if ‘systems thinking’ is the outcome it therefore must require a system in order to achieve that outcome. And, if it’s a system, it must therefore satisfy the Law Of System Completeness.

At first it isn’t obvious that any of the four DSRP elements bear much of a resemblance to any of the six essential elements contained in the Law. There’s perhaps a case to say that all four are merely heuristics that might be seen to form part of the ‘Engine’ of a Systems-Thinking system? But then, if we zoomed in and looked at this Engine as its own system that in turn must also satisfy the Law of System Completeness, we’re no better off in our attempt to make a connection between DSRP and the Law than we were before we started.

It was time to dig deeper:

What might the ‘Engine’ of the Systems-Thinking system be? Out of the four DSRP options, it is the Perspectives element that seems to offer up the closest match since it is the one that’s about ‘understanding’ and, in effect, the ability to overcome psychological inertia.

‘Systems’ then, because when you read the book, gets closely associated with ‘meta-cognition’, thus seems to be the Cabreras’ way of saying that this is supposed to be the higher level ‘Coordination’ part of the overall system.

Next up is Distinctions. Based on the Cabreras’ descriptions, this seems to relate to the Tool (‘thing’ in the Cabreras’ terminology) part of the TRIZ Law. Except not quite, because the way it is described is all about distinguishing between ‘the thing’ and ‘not the thing’. I think this means we have to interpret it as part Tool and part Interface. I can’t see it as being the whole of the Interface story because if we’re trying to map the ‘system’ for ‘system-thinking’, the Interface necessarily needs to incorporate the idea of context and the ‘thing’ the system is supposed to ‘work on’. The Interface is the tooth acted upon by the toothbrush bristles (tool); it is the market demand on which the new product innovation has to serve. In the Systems Thinking context, the analogy for ‘Interface’ must therefore relate to the problems or situational context on which the thinking is focused. The ‘D’ in DSRP doesn’t really cover all of this part of the story, and nothing I can see in the Cabreras’ book seems to give me any further clues that they see ‘context’ as an essential part of the Systems-Thinking story.

Finally, comes the Relationships part of the story, and all the 'between' aspects of the systems-thinking story. One way of looking at this is that the 'R' in DSRP is therefore all about the lines between the six elements in the Law of System Completeness? But then, 'Transmission' is also about connections and specifically the relationship between the Engine and the Tool, so it feels logical to connect the two ideas.

Overall, then, the DSRP/LoSC overlap story seems to come down to this:

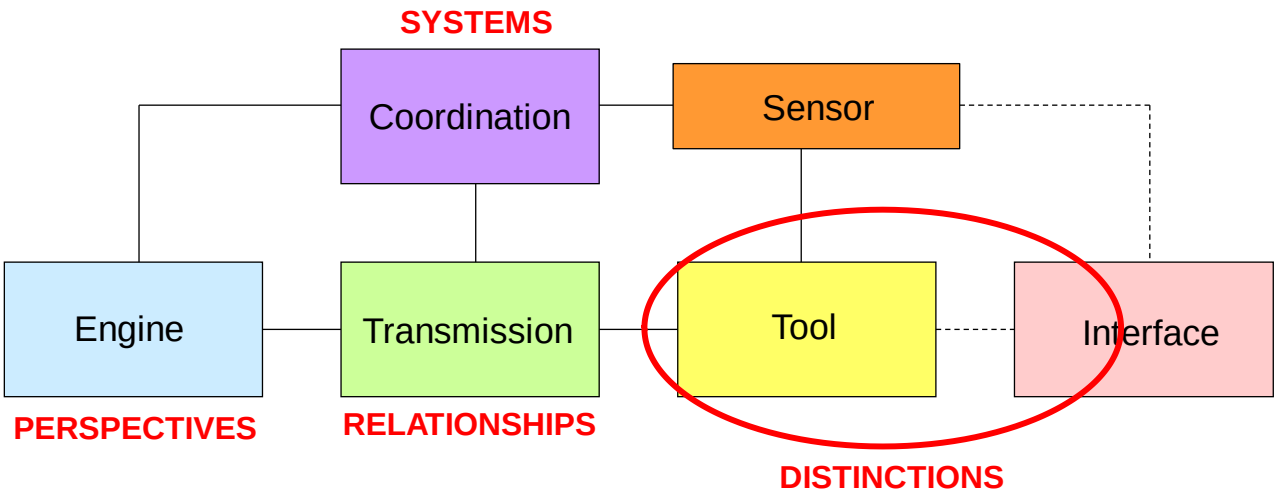

Figure 1: Aligning DSRP and LoSC

So What?

Overall, I would have to say that DSRP has a lot more to learn from TRIZ than the other way around. DSRP might be essential elements of the Systems-Thinking story, but because they don't satisfy the Law Of System Completeness, while they might be necessary, they are not sufficient. You can't have a system to achieve Systems-Thinking if you don't have a meaningful Interface to the external context on which you're looking to achieve the desired systems-thinking outcome. Similarly, you can't achieve systems-thinking if you don't have Sensors – i.e. ways and means to measure what is happening during the Systems-Thinking process.

Taken the other way around, we might ask, what does DSRP contribute to the TRIZ story. The answer to this question is somewhat less clear I think. The Cabreras' insight about defining 'systems-thinking' as a (meta-)system is useful to some degree. It always being useful to keep in mind where you are process-wise during any activity working on wicked problems. Beyond that, I've also had some new insights arrive to me when trying to work on a long-standing wicked problem we occasionally find ourselves dabbling with. This insight came from the recognition from the 'D' part of the DSRP story that its sometimes necessary to look at what the focus *is not* as much as focusing on what it is.

Finding a synergy is always good, taking us as it does, a tiny step closer to a possible eventual 'Theory Of Everything'. It would be lovely to think that Derek and Laura Cabrera – who also appear to be embarked on their own 'ToE' journey – might one day take a look at what TRIZ has already revealed rather than re-inventing more unnecessary, and rather noisy, wheels.

Reference

1) Cabrera, D., Cabrera, L., 'Systems Thinking Made Simple: New Hope For Solving Wicked Problems,' Odyssean Press, 2015.

Not So Funny – Principle 8, Counterbalance

“Where the weight of an object or system causes problems, combine it with something that provides lift.”

Or:

“When an entity or system deviates from a desired path, introduce protocols or forces that provide a re-stabilising effect”….

…too many pesky job applicants? Try this Principle 8 counter-balance genius…

More passionate than ever? So claims election candidate Yves Levesque. But don’t allow too much passion. Let your electric windows apply just the right level of counterbalance…

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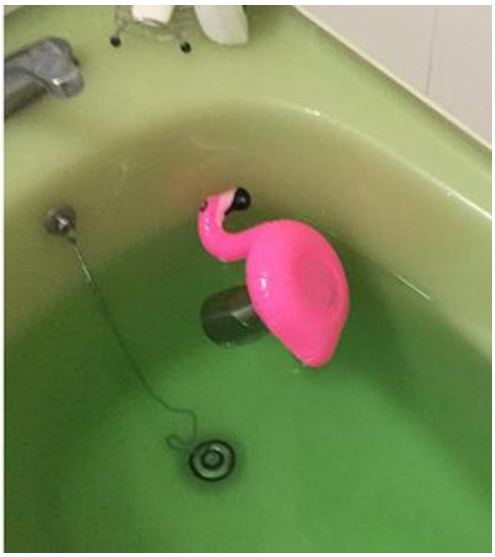
Drinking too much?



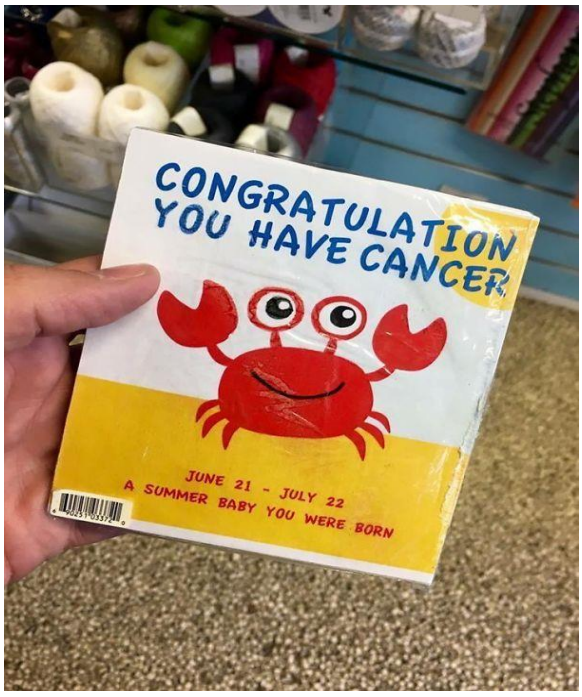
Too somber?

Too pretty?

Golf not challenging enough?

Don’t want to look too arrogant with your amazing design capabilities?

Or, finally, not wishing to put too much of a downer on affairs, are Birthdays too happy?



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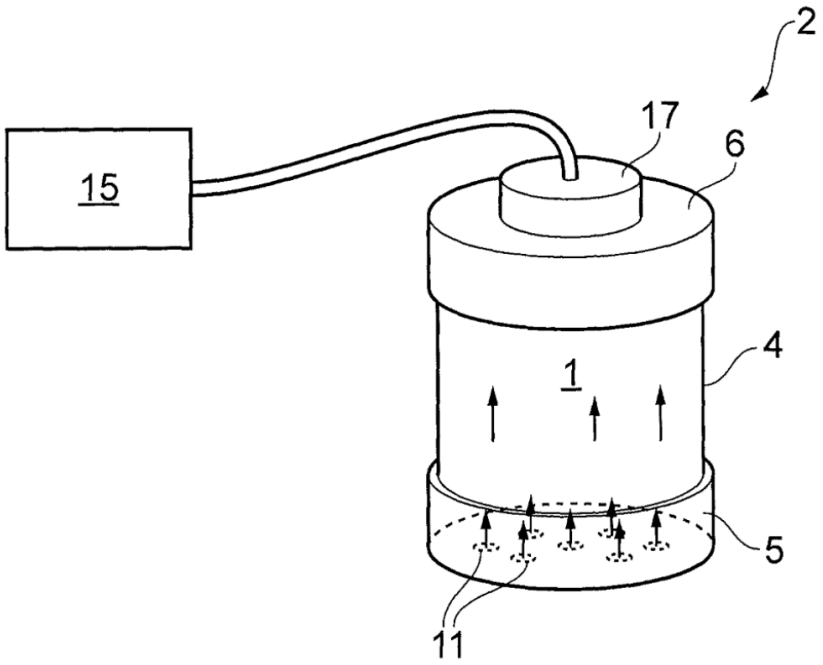
Patent of the Month – Graduated Auxetic Foam



Our patent of the month this month sticks to the world of ‘keep-it-simple’, and also manages to stay local. My old haunt, Rolls-Royce in Bristol to be precise, and a pair of inventors who had US9,956,729 granted to them on May 1st. Regular readers will know that auxetic (or negative Poisson’s Ratio) materials has long been one of our favourite technologies, and one we mention wherever we go, usually in the vain hope that someone will finally find a way to make positive use of the unique capabilities the novel material structure offers. One of the stumbling blocks we’ve observed has related to the difficulty of manufacture of structures containing just the right auxetic properties. One of those ‘just right’ properties being the ability to engineer the right level of negative Poisson’s ratio at different physical positions. Graduated auxetics has thus become one of the ‘holy grail’ targets of prospective auxetic material designers. Now, thanks to the Rolls-Royce invention, it looks like we have what is needed.

Here’s what the RR engineers have to say on the problem at hand:

Materials having a negative Poisson's ratio, when stretched, become thicker in a direction perpendicular to the direction of the applied force. This behaviour is a consequence of hinge-like structures within the material which flex when stretched. Materials which display a negative Poisson's ratio are often referred to as "auxetic" materials, and have very different properties to non-auxetic conventional materials having a positive Poisson's ratio. Auxetic materials have mechanical properties characterised by high energy absorption and high fracture resistance, and are also highly absorbent.

It is known that auxetic materials can be manufactured from open-cell foams such as open-cell polyurethane foam. Open-cell foams are foams in which the cells are not closed, but communicate with one another through openings in the cell walls. The cells can be considered to be defined by ribs rather than walls such that the cells create a network of interconnected pores within the foam.

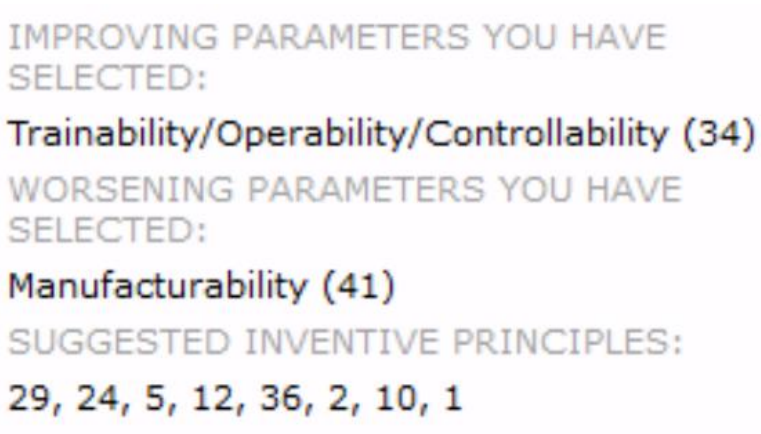
WO9925530 describes a method of manufacturing auxetic foam in which a piece of low density open-cell polyurethane foam is first placed within a mould. The mould comprises sets of opposing plates which are moved towards each other to compress the foam in three orthogonal directions. Compression of the foam causes the ribs of the cells to buckle. The foam is then heated under

compression to a plastic or semi-plastic state which causes the ribs to become permanently deformed. The foam is subsequently cooled to set the ribs in their deformed state thereby creating a foam in which the cells have a re-entrant structure. It is this re-entrant structure which provides the hinge-like structures that give rise to a foam having a negative Poisson's ratio.

There are perceived to be potential advantages to an auxetic foam having a Poisson's ratio which varies across its extent. For example, certain applications for sound proof panels, acoustic linings, duct liners, vibration mat pads and filters could be improved if such an auxetic material could be provided. However, heretofore there have not been provided any suitable methods to produce such a foam.

It is a preferred object of the present invention to provide an improved method of manufacturing a foam, and more particularly to provide a method of manufacturing a foam having a Poisson's ratio which varies across at least a region of the foam in a gradient distribution.

Here's how we might best map the basic contradiction needing to be solved onto the Contradiction Matrix:

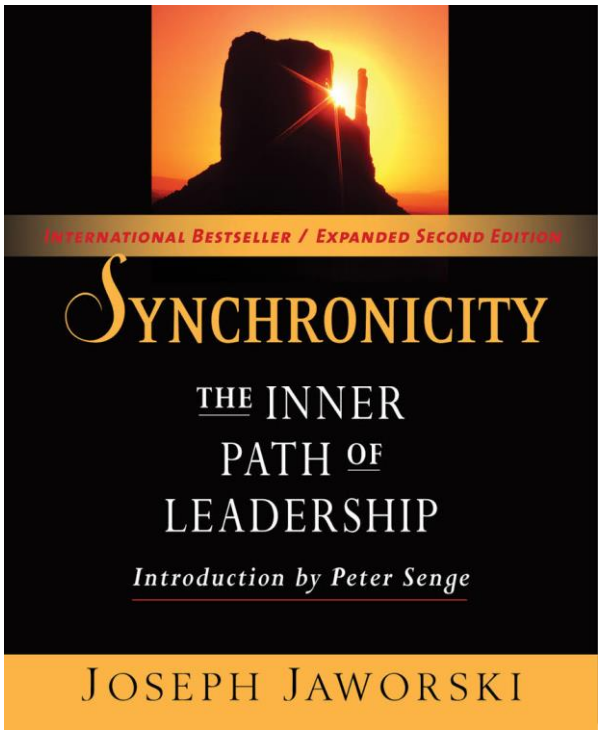


And here's how the inventors solved the problem:

A method of manufacturing a foam having a varying Poisson's Ratio, the method comprising the steps of: a) providing a housing defining an internal space having at least one inlet aperture and an outlet aperture, the inlet and outlet apertures being in fluid communication with the internal space and spaced from one another across the internal space; b) providing an open-cell foam of a size and shape configured to fit inside the internal space of the housing; c) positioning the foam inside the internal space of the housing; d) establishing a flow of air through the foam via the inlet and outlet apertures, such that the local pressure within the foam varies with increasing distance from a value at or near the inlet aperture to a higher value thereof at or near the outlet aperture; e) heating the foam to a predetermined temperature whilst maintaining said flow of air through the foam; and f) subsequently cooling the foam whilst continuing to maintain said flow of air through the foam, wherein the Poisson's ratio of the cooled foam varies with increasing distance from a value at or near the inlet aperture to a lower value thereof at or near the outlet aperture.

Spot the Inventive Principles?
29, Fluid ('*a flow of air through the foam*') and 12, Equi-potentiality (in reverse) ('*such that the local pressure within the foam varies with increasing distance from a value at or near the inlet aperture to a higher value*'). Simple when you know how.

Best of the Month – Synchronicity



To be honest, I've put off reading this book for a long time. It's sat in my library, next to The Fifth Discipline since I found a copy in a junk shop several years ago. The reason I invested a whole £1 in it is largely because Peter Senge wrote the introduction. Beyond that, the cover photo and the words 'inner path' have meant that, whenever I see the book's spine on the shelf, I immediately think it's going to be a bit of a 'woo-woo' journey into New Age nonsense. As it turns out, I couldn't have been more wrong. My own piece of timely synchronicity maybe?

Synchronicity, the book, turns out to be an inspirational guide to developing the most essential leadership capacity for our time: how we can collectively shape our future. Through the telling of his life story (through the framework of Joseph Campbell's 'Hero's Journey' – even better), Jaworski posits that a real leader sets the stage on which "predictable miracles, " seemingly synchronistic in nature, can - and do - occur. While I realise that the word 'miracle' definitely sounds like we're heading to Woo-Woo-Land, it's important to know that what he's actually talking about is Campbell's 'Ordeal' and the subsequent resolution of a contradiction. He shows that this capacity has more to do with our being - our total orientation of character and consciousness - than with what we do. Leadership, he explains, is about creating - day by day - a domain in which human beings continually deepen their understanding of reality and are able to participate in shaping the future. He describes three basic shifts of mind required if we are to create and discover an unfolding future - shifts in how we see the world, how we understand relationships, and how we make commitments - and offers a new definition of leadership that applies to all types of leaders.

The charm of Jaworski's story is that it is his own, personal story. He was a successful North American lawyer from a famous family of lawyers, and the promise of a successful life ahead of him – until the day his wife suddenly asked him for a divorce. He was in his early 40's. His world crashed around him and he was faced with having to construct a new

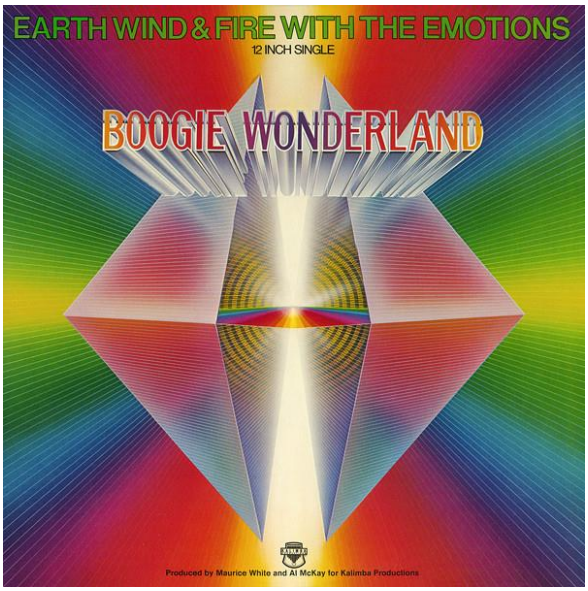
one. Within that process, he found himself again, and re-discovered ways to connect with his intuition and the natural flow of life.

Many good things happened to him personally and professionally from then on.
His life is particularly interesting if you are interested in the subject of leadership. As a result of a series of very interesting events and encounters – what some might describe as "coincidences" – Jaworski found himself "called" to fund the American Leadership Forum. He was then headhunted to lead the now very famous scenario building team at Shell headquarters in the UK.

This book offers some great tips on how to be, learn, intuit and change, and work in partnership with life – not against it, or in spite of it… One tip that will remain with me is to nurture the courage to act on what we sense. In particular, to reach out to people we meet and immediately "know" from the moment we first see them – without knowing why or how. That is how Jaworski met his second wife – in an airport, of all places – and many other key figures on his journey. We often allow our mind to hold us back, out of fear, or out of respect to social norms. Jaworski's life story shows that life can be more rewarding when we trust and follow our inner knowing and allow ourselves to connect with others, only because we sense we need to – not because we need something specific from them – thus, we are able to allow life to unfold according to its natural, benevolent flow.
The moral of the story? Good things happen when we listen to our inner voice or follow our (contradiction solving) intuition – when we are connected to it…

…not to mention that Senge's 14-page Introduction alone is worth the price of entry.

Wow In Music – Boogie Wonderland



Disco music is one of the most denigrated of all the popular genres. For the most part there is good reason for the criticism. The cream, however, always rises given time, and Earth, Wind & Fire's massive hit, Boogie Wonderland, from 1979 has been an enduring classic ever since it first hit the charts.

The least obvious aspect of the song is the downbeat lyric – a (Principle 13) antidote to the usually happy-clappy-let's-party sentiment of most disco records. As such, it is one of the more complex and misinterpreted songs of the disco era. Written by Jon Lind and Allee Willis, it was inspired by the movie Looking For Mr Goodbar, which stars Diane Keaton as a lost soul who goes to clubs every night to dance away her misery.

In an interview with Willis, she explained: "When I saw Mr Goodbar, I got kind of fascinated with people who did go to clubs every night, whose life was kind of falling apart, but they lived for the night life, though it didn't seem to be advancing them as humans in the end. So if you really look at the lyrics of 'Boogie Wonderland,' unlike EW&F's previous hit, 'September,' it's not a happy song at all. It's really about someone on the brink of self-destruction who goes to these clubs to try and find more, but is at least aware of the fact that if there's something like true love, that is something that could kind of drag them out of the abyss.

So for instance, the first verse is:

Midnight creeps so slowly into hearts of men who need more than they get
Daylight deals a bad hand to a women who's laid too many bets
The mirror looks you in the face and says, 'uh-uh baby, it don't work'
You say your prayers, though you don't care, you dance to shake the hurt

And then on the first demo, it went right into the chorus, where with Earth, Wind & Fire it's more of a feel thing, and they usually do all the verses before they get to the chorus (Principle 10, Prior Action). And then the chorus is:

All the love in the world can't be gone
All the need to be loved can't be wrong
All the records are playing
And my heart keeps saying 'Boogie Wonderland'

So 'Boogie Wonderland' for us was this state of mind that you entered when you were around music and when you danced, but hopefully it was an aware enough state of mind that you would want to feel as good during the day as you did at night."

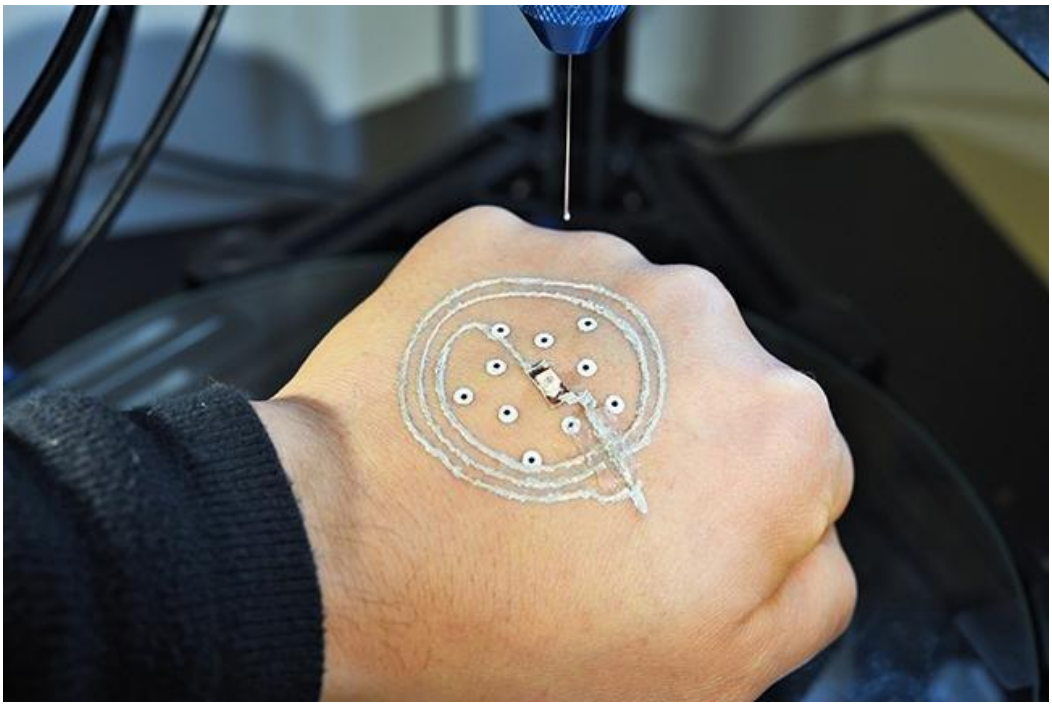
All that said, most listeners will keep coming back to the song for the music. Again very atypical of the disco genre. Albeit in some quite subtle ways. Here's Allee Willis again:

"In those days, every dance record had a disco hi-hat on it, so I figured the song would be even more different if we (Principle 2) took it out. But when we made a demo, the drummer couldn't play the beat without one. There weren't many women songwriters back then, and no matter how many times I told him to stop playing it, he was like: "Screw her." I finally said to Jon: "If you don't do something, I am going to physically go in there." Jon is a big guy, and literally lifted the hi-hat off the drumkit and out of the studio. To this day, every time I hear the song, I think about that drummer and grin.

Beyond that, listen hard to the band's rhythm section and you'll hear that everyone – bass, drums, keys, rhythm-guitar, percussion, everyone - is playing (Principle 37) off the beat. The net result being that if hearing the opening bars of the song doesn't make you want to get up and boogie (wonderland), you're probably dead. Musicians often talk about those rare nights when they're playing 'in the pocket'. Boogie Wonderland is the 'in the pocket' reference par excellence.

Damn, even penguins can dance to it (https://www.youtube.com/watch?v=V7vjxhqMPng – from the 4:09 mark)

Investments – 3D-Printed Skin Sensors



In a groundbreaking new study, researchers at the University of Minnesota used a customized, low-cost 3D printer to print electronics on a real hand for the first time. The technology could be used by soldiers on the battlefield to print temporary sensors on their bodies to detect chemical or biological agents or solar cells to charge essential electronics.

Researchers also successfully printed biological cells on the skin wound of a mouse. The technique could lead to new medical treatments for wound healing and direct printing of grafts for skin disorders.

"We are excited about the potential of this new 3D-printing technology using a portable, lightweight printer costing less than $400," said Michael McAlpine, the study's lead author and Associate Professor in the Mechanical Engineering faculty. "We imagine that a soldier could pull this printer out of a backpack and print a chemical sensor or other needed electronics, directly on the skin. It would be like a 'Swiss Army knife' of the future with everything they need all in one portable 3D printing tool."

One of the key advances of the new 3D-printing technique is that this printer can adjust to small movements of the body during printing. Temporary markers are placed on the skin and the skin is scanned. The printer uses computer vision to adjust to movements in real-time.

"No matter how hard anyone would try to stay still when using the printer on the skin, a person moves slightly, and every hand is different," McAlpine said. "This printer can track the hand using the markers and adjust in real-time to the movements and contours of the hand, so printing of the electronics keeps its circuit shape."

Another unique feature of this 3D-printing technique is that it uses a specialized ink made of silver flakes that can cure and conduct at room temperature. This is different from other

3D-printing inks that need to cure at high temperatures (up to 100 degrees Celsius or 212 degrees Fahrenheit) and would burn the hand.

To remove the electronics, the person can simply peel off the electronic device with tweezers or wash it off with water.

In addition to electronics, the new 3D-printing technique paves the way for many other applications, including printing cells to help those with skin diseases. McAlpine's team partnered with University of Minnesota Department of Pediatrics doctor and medical school Dean Jakub Tolar, an expert on treating rare skin disease. The team successfully used a bioink to print cells on a mouse skin wound, which could lead to advanced medical treatments for those with skin diseases.

"I'm fascinated by the idea of printing electronics or cells directly on the skin," McAlpine said. "It is such a simple idea and has unlimited potential for important applications in the future."

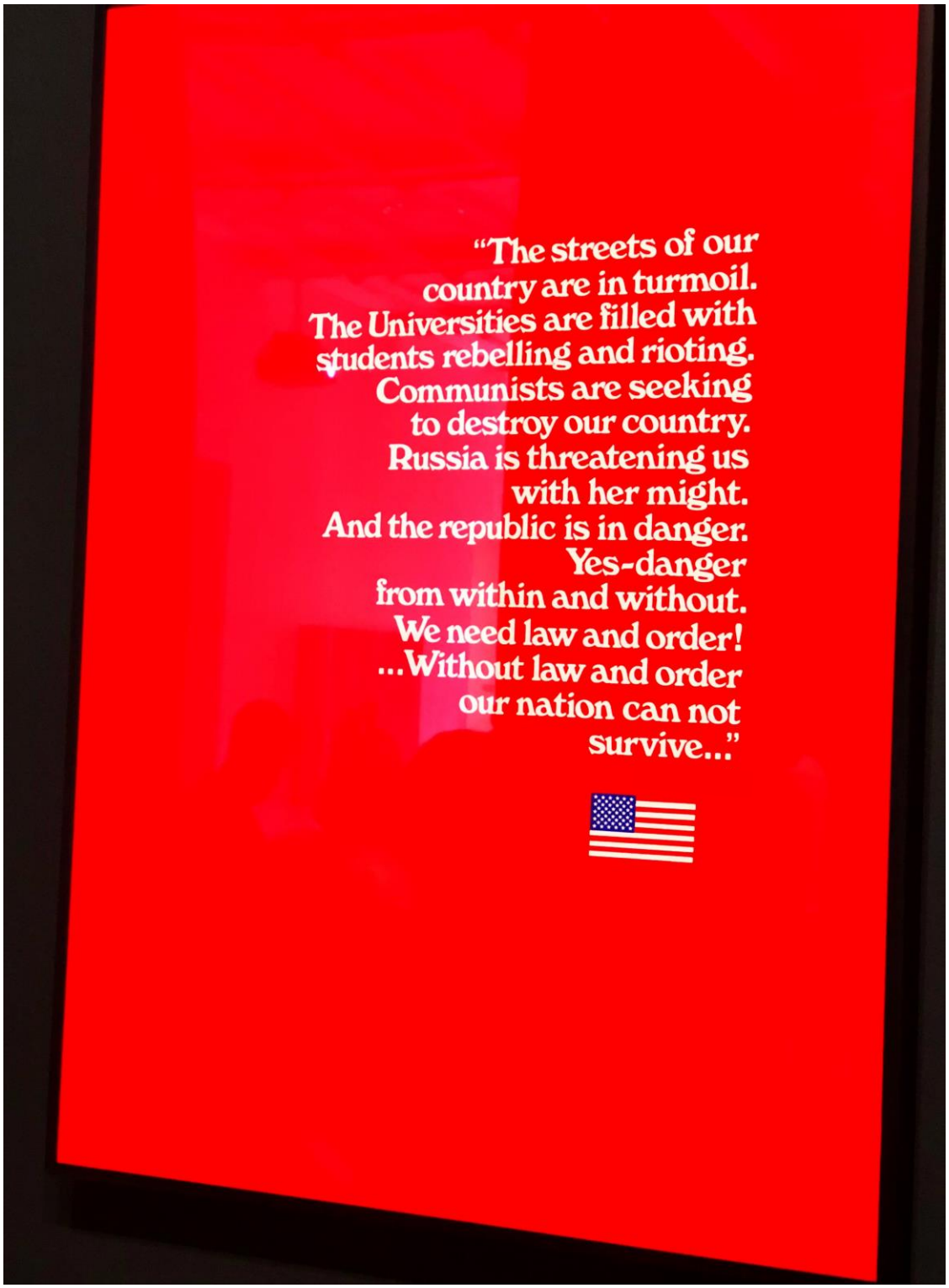
See More:
Video: https://youtu.be/DTXqUrmr3FQ
Video: https://youtu.be/t5C3OyKY_2g

Read more:
Zhijie Zhu, Shuang-Zhuang Guo, Tessa Hirdler, Cindy Eide, Xiaoxiao Fan, Jakub Tolar, Michael C. McAlpine. 3D Printed Functional and Biological Materials on Moving Freeform Surfaces. Advanced Materials, 2018; 1707495 DOI: 10.1002/adma.201707495

Read even more:
Start with patent application - US20160218287

Generational Cycles – Spot The Year?

Let's keep things simple this month. Here's a poster from the Whitney Museum. Can you guess the year?



Answer on the next page:

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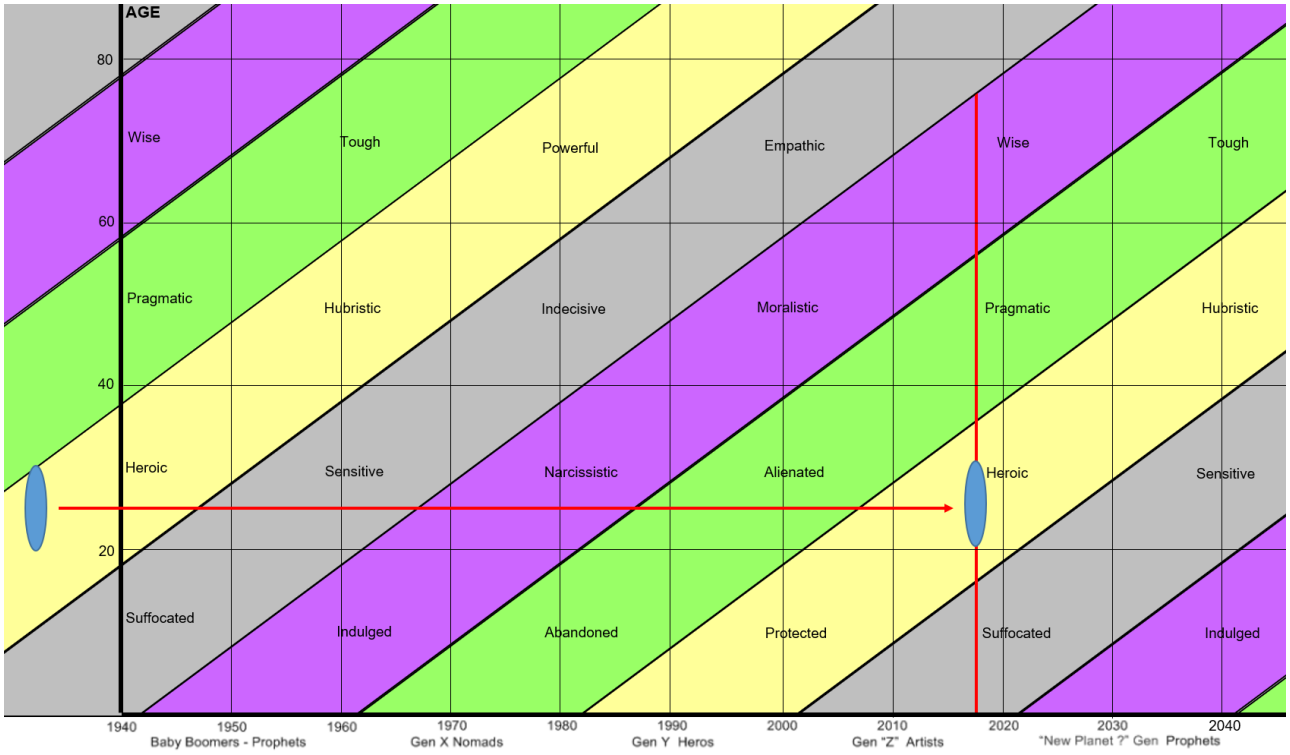
And here's the point….



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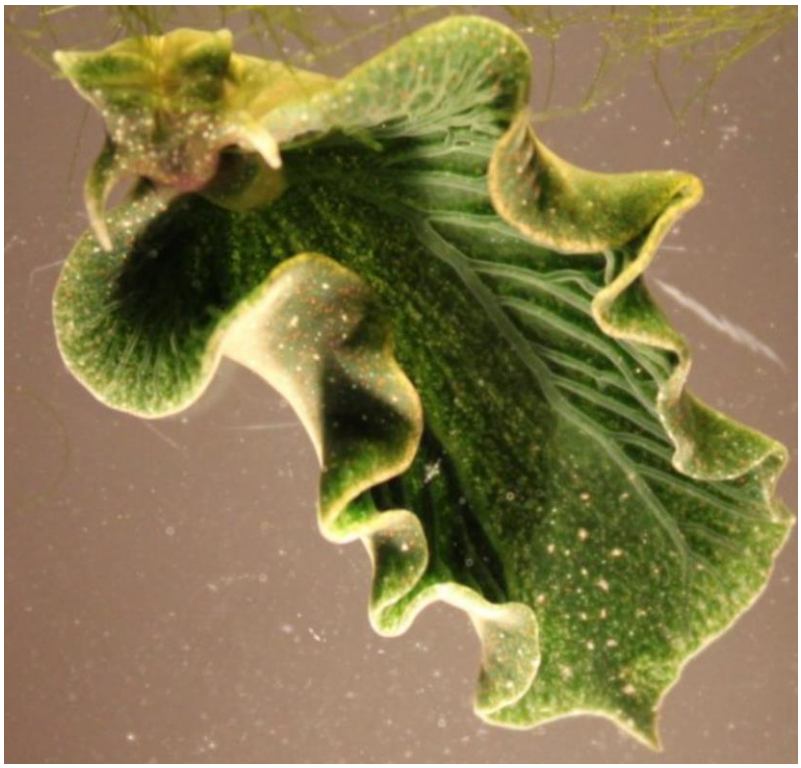
Biology – Sea Slug (Elysia chlorotica)



In an amazing achievement akin to adding solar panels to your body, a Northeast sea slug sucks raw materials from algae to provide its lifetime supply of solar-powered energy, according to a study recently published by scientists at Rutgers University-New Brunswick.

"It's a remarkable feat because it's highly unusual for an animal to behave like a plant and survive solely on photosynthesis," said Debashish Bhattacharya, senior author of the study and distinguished professor in the Department of Biochemistry and Microbiology at the University. "The broader implication is in the field of artificial photosynthesis. That is, if we can figure out how the slug maintains stolen, isolated plastids to fix carbon without the plant nucleus, then maybe we can also harness isolated plastids for eternity as green machines to create bioproducts or energy. The existing paradigm is that to make green energy, we need the plant or alga to run the photosynthetic organelle, but the slug shows us that this does not have to be the case."

The sea slug Elysia chlorotica, a mollusk that typically grows to more than 2 inches long, has been found in the intertidal zone between Nova Scotia, Canada, and Martha's Vineyard, Massachusetts, as well as in Florida. Juvenile sea slugs eat the nontoxic brown alga Vaucheria litorea and become photosynthetic – or solar-powered – after stealing millions of algal plastids, which are like tiny solar panels, and storing them in their gut lining.

Photosynthesis is when algae and plants use sunlight to create chemical energy (sugars) from carbon dioxide and water. The brown alga's plastids are photosynthetic organelles (like the organs in animals and people) with chlorophyll, a green pigment that absorbs light.

This particular alga is an ideal food source because it does not have walls between adjoining cells in its body and is essentially a long tube loaded with nuclei and plastids,

Bhattacharya said. "When the sea slug makes a hole in the outer cell wall, it can suck out the cell contents and gather all of the algal plastids at once," he said.

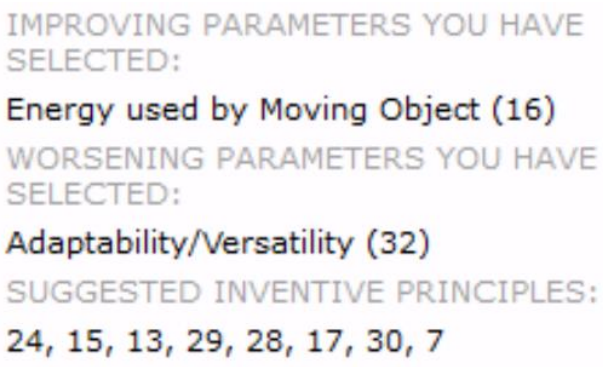
Based on studies of other sea slugs, some scientists have argued that they steal and store plastids as food to be digested during hard times, like camels that store fat in their humps, Bhattacharya said. This study showed that's not the case for solar-powered Elysia chlorotica.

"It has this remarkable ability to steal these algal plastids, stop feeding and survive off the photosynthesis from the algae for the next six to eight months," he said.

The team of Rutgers and other scientists used RNA sequencing (gene expression) to test their solar energy supply hypothesis. The data show that the slug responds actively to the stolen plastids by protecting them from digestion and turning on animal genes to utilize the algal photosynthetic products. Their findings mirror those found in corals that maintain dinoflagellates (also algae) – as intact cells and not stolen plastids – in symbiotic relationships.

Whereas Elysia chlorotica stores plastids, the algal nuclei that are also sucked in don't survive, and scientists still don't know how the sea slug maintains the plastids and photosynthesis for months without the nuclei that are normally needed to control their function, Bhattacharya said.

Meanwhile, from a contradiction-resolution perspective, Elysia chlorotica's sequestering of algal plastids is a classic Principle 24, Intermediary, solution strategy. Here's what the underlying energy-versus-lack-of-reliable-access-to-food conflict pair looks like when mapped on to the Contradiction Matrix:



…and her again, we see nature doing the same as human designers. Or should that be the other way around? Or maybe, we should now start looking at how humans would solve their equivalent of the removed-nuclei trick and see if that helps us to understand the still unsolved mystery of how Elysia chlorotica does it.

Read more here::
Cheong Xin Chan, Pavel Vaysberg, Dana C Price, Karen N Pelletreau, Mary E Rumpho, Debashish Bhattacharya. Active Host Response to Algal Symbionts in the Sea Slug Elysia chlorotica. Molecular Biology and Evolution, 2018; DOI: 10.1093/molbev/msy061

Short Thort

"Empathy is a hand thick with scars offering you a bandage."
Richelle E. Goodrich, Slaying Dragons

"If only you'd remember before ever you sit down to write that you've been a reader long before you were ever a writer. You simply fix that fact in your mind, then sit very still and ask yourself, as a reader, what piece of writing in all the world Buddy Glass would most want to read if he had his heart's choice. The next step is terrible, but so simple I can hardly believe it as I write it. You just sit down shamelessly and write the thing yourself. I won't even underline that. It's too important to be underlined."
J.D. Salinger, Raise High the Roof Beam, Carpenters & Seymour: An Introduction

News

Product Development Symposium 2018
Darrell will be keynoting at this year's PDS event, taking place at DTU in Copenhagen in November. He'll be featuring during the Robust Design day (Thursday 8th) to discuss the links between TRIZ and Robust Design. Expect some robust criticism of Professor Nam Suh and Taguchi Methods. Register for the event here… http://www.pd-symposium.org/.

TCI Oceania 2018 Conference
Darrell will also be co-presenting with FIAL managing-director, Mirjana Prica during the Forum day – 6 June – at the TCI ("the global practitioners network for competitiveness, clusters and innovation"), 'Why Clusters Matter'-themed conference at the rather splendid Sunshine Coast in Australia. It's a dirty job, but someone… etc.

India
The workshop planned for the third week of May in Bengaluru, has now been shifted and extended to cover the last two weeks of September, which means Darrell's trip this month is much shortened, and there will be a (longer) new one in September/October. At this point in time, beyond the two week stay in Bengaluru, the weeks immediately before and

after are ‘available’ if anyone else in the country wants Darrell to come and do something with them. Contact him directly if you wish to explore possibilities.

USA
Darrell, again, has a client week in Florida confirmed for the week 30 July to 3 August. The weeks immediately before and after are also currently ‘available’ if anyone wants to make use of them.

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

- Transport – Strategic Problem Solving Workshop
- Transport – Technology Evolution Study
- Public Sector – SI Certification Workshops
- FMCG – PanSensic Project
- Automotive – TRIZ Certification Workshops
- Fintech – Customer Mapping Project
- FMCG – Innovation Capability Strategy Workshop
- Mining – Strategic Project
- FMCG – IP Development Study