Friday Thinking 29 April 2016 -
Hello all – **Friday Thinking** is a humble curation of my foraging in the digital environment. My purpose is to pick interesting pieces, based on my own curiosity (and the curiosity of the many interesting people I follow), about developments in some key domains (work, organization, social-economy, intelligence, domestication of DNA, energy, etc.) that suggest we are in the midst of a change in the conditions of change - a phase-transition. That tomorrow will be radically unlike yesterday.

If anyone should not want to receive these emails – please feel free to reply johnverdon@gmail.com and I will happily take you off the distribution list.

In order to keep this email more readable for mobile access I've only included brief comments, headline-link and in some cases an excerpt of the article. If anyone prefers to view this as a web page you can do this by going my **Friday Thinking** web page http://johnverdon-friday-thinking.blogspot.ca/

Many thanks to those who enjoy this. ☺

In the 21st Century curiosity will SKILL the cat.

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"Be careful what you 'insta-google-tweet-face'"

Woody Harrelson - Triple 9

http://www.imdb.com/title/tt1712261/?ref_=nv_sr_1

"ONE OF THE first things I learned from my recent tour of the synthetic-reality waterfront is that virtual reality is creating the next evolution of the Internet. Today the Internet is a network of information. It contains 60 trillion web pages, remembers 4 zettabytes of data, transmits millions of emails per second, all interconnected by sextillions of transistors. Our lives and work run on this internet of information. But what we are building with artificial reality is an internet of experiences. What you share in VR or MR gear is an experience. What you encounter when you open a magic window in your living room is an experience. What you join in a mixed-reality teleconference is an experience. To a remarkable degree, all these technologically enabled experiences will rapidly intersect and inform one another."

"The recurring discovery I made in each virtual world I entered was that although every one of these environments was fake, the experiences I had in them were genuine."
VR does two important things: One, it generates an intense and convincing sense of what is generally called presence. Virtual landscapes, virtual objects, and virtual characters seem to be there—a perception that is not so much a visual illusion as a gut feeling. That's magical. But the second thing it does is more important. The technology forces you to be present—in a way flatscreens do not—so that you gain authentic experiences, as authentic as in real life. People remember VR experiences not as a memory of something they saw but as something that happened to them.

***Experience is the new currency in VR and MR**. Technologies like Magic Leap's will enable us to generate, transmit, quantify, refine, personalize, magnify, discover, share, reshare, and overshare experiences. This shift from the creation, transmission, and consumption of information to the creation, transmission, and consumption of experience defines this new platform.*

Artificial reality exploits peculiarities in our senses. It effectively hacks the human brain in dozens of ways to create what can be called a chain of persuasion.

All that said, it was not the reality of artificial reality that surprised me most. It was how social it is. ***The best experiences I had in VR or MR involved at least one other person. More people made it better. In fact, just a few more people made it exponentially better****. It's a network effect: The joy of VR is proportional to the square of the number of people sharing it. That means VR will be the most social medium yet. More social than social media is today.*

Kevin Kelly - The Untold Story of Magic Leap, World's Most Secretive Startup

http://www.wired.com/2016/04/magic-leap-vr/

Our clients have access to the code we are writing from the first line we commit. When my developers and I code review each other's work, the client can see and also participate in that code review. In that way, they get to understand (and buy in on) not only the end result, but the rationale behind it. Clients also send their developers to work side by side with us. We take them in as a part of our team, submit them to the same grueling code reviews we all go through.

We've found that they are happier this way. ***The transparency I feared, the risk taken by trying to explain something and failing, has been far outweighed by the practical benefits of healthy collaboration. They now feel the end result belongs to them, rather than being something forced on them from outside or upper management.***

There is also something great about letting a client peek inside the works… they find bugs, omissions, and misunderstandings. Why is that great? Because they find them right away, rather than several weeks or months into a project. They also feel empowered to open github issues for those bugs, helping us do our job even better. Instead of it being a terrible thing to find bugs, it becomes an ordinary part of the process.

WHY I RUN MY BUSINESS LIKE AN OPEN SOURCE PROJECT

http://www.stubbornella.org/content/2013/02/26/why-i-run-my-business-like-an-open-source-project

*A quote attributed to U.S. journalist Hodding Carter Jr. floats above his head, and Dr. Anagnostou reads it out loud: "****There are only two lasting bequests we can hope to give our children. One of these is roots; the other wings.****"*

ADHD, OCD, autism:

time to redraw the boundaries separating childhood behavioural disorders?

http://www.theglobeandmail.com/life/health-and-fitness/health/giving-children-roots-and-wings-the-struggle-to-understand-autism/article29721444/

This is a **MUST VIEW** 7 min video - the domestication of DNA is accompanied with the domestication of our neurology. This may be very interesting for anyone interested in the future of prosthetics, enhancing our sensing capabilities or even computer vision and other senses. Clinical trials begin next year..

The Technology That Could Make Blind People See Again

https://www.ted.com/talks/sheila_nirenberg_a_prosthetic_eye_to_treat_blindness?language=en

Published on 5 Apr 2016

Neuroscientist Sheila Nirenberg received a MacArthur Genius Award for figuring out, for the first time ever, how our retinas take images from the outside world and turn them into a neural “code” that the brain can understand. It started as a pure research project, but now she’s building the code into a device that could bring sight to the blind. (Video by Alan Jeffries)

...what makes the technology that Nirenberg has built rather remarkable. She has found a way to transmit a visual code directly to the brain, bypassing damaged cells in the eye. In other words, she can help the blind see again.

Here’s a 38 min video of a later presentation with a longer Q & A. It’s fascinating - to realize who the audience is during the Q & A after the 18 min presentation

STEM Expo Keynote

https://www.youtube.com/watch?v=2Lz8j-MZxrU

"Breaking The Blindness Code". Through a combination of gene therapy and computer programing- blindness need no longer be a limiting factor in our lives!

This is a great 50 min video about key issues of design - including organizational design - and most vitally - organizing information to enable vast improvements in Knowledge Management.

Peter Morville - The Architecture of Understanding

https://www.youtube.com/watch?v=s-xWkYMaSis

Published on 9 Dec 2015

We think we're designing software, websites, and experiences. But we're not. We are agents of change. Our systems shape belief and behavior at scale. If we hope to be better, empathy for the user isn't enough. We must also wrangle with culture, governance, methods, metrics, and the false dichotomies of mind-body and plan-build, because the things we make are reflections of how we see and sort ourselves. In this spirited tour of information architecture, organizational strategy, and systems thinking, Peter Morville draws from his new book, Intertwingled, to reveal how everything is connected, from code to culture.

Peter Morville is a pioneer of the fields of information architecture and user experience. His best-selling books include Information Architecture (the "polar bear book"), Ambient Findability, Search Patterns, and Intertwingled. He advises such clients as AT&T, Cisco, Harvard, IBM, Macy's, the Library of Congress, and the National Cancer Institute. His work has been covered by Business Week, The Economist, NPR, and The Wall Street Journal. Peter lives in Ann Arbor, Michigan with his wife, two daughters, and a dog named Knowsy.

This is a great 5 min article by Yaneer Bar Yam of complexity fame. Well worth the read especially for social scientists who can often forget the importance of relational foundations of the subjects of study.

Relational Properties in Objective Science

https://medium.com/complex-systems-channel/relational-properties-in-objective-science-d723ddb4fac4#.t92owiy47

A remarkable insight in the study of complex systems is the importance of thinking in terms of dependencies or relationships. This is a key difference from reductionist approaches. Here I will discuss the concept of “relational properties” (properties that exist due to a relationship between something and something else), to distinguish them from properties of a thing. Properly identifying properties that are relational is critical to ensuring valid scientific treatment and logic. Otherwise, properties that are relational could be dismissed as subjective and not part of science. Properly formulating relatedness enables subjective properties to become objective, which then are not mutually exclusive—subjective properties can be objectively defined as relational.

More than a focus on parts rather than wholes, a focus on things—-objects, parts, elements or wholes—-causes problems when the properties we are interested in are actually properties of the relationships between things, or the context in which things are found. In the study of networks, the degree of connectivity of a node is a property of the relationships between nodes rather than of a node itself. There are many more examples.

In reductionist thinking, fitness is considered a property of the organism, or better yet of the gene. However, fitness is actually a property of an organism in a particular context. Put the same organism into a different context, and its fitness is different. This may seem obvious when stated this way, but the mathematical formulations of evolution often ignore this. They assign fitness to the organism (or gene) by averaging over the possible contexts. When an organism samples all possible places, and a gene samples all possible genetic combinations it might be part of, then we can talk about its average fitness without regard to context. But this is a strong assumption, and there are important implications for discussions of altruism and other cooperative behaviors when it is not true.

Another article based on complexity sciences - should be of interest to anyone who wants to know more about how to spread or enact positive changes.

Why Beneficial Epidemics Spread More Quickly than Harmful Ones

https://www.technologyreview.com/s/601298/why-beneficial-epidemics-spread-more-quickly-than-harmful-ones/

Complexity theorists and biologists reveal how benefits spread super-exponentially through populations.

The spread of disease is a well-studied problem. This work has provided numerous insights into the nature of harmful epidemics and the strategies for controlling or preventing them.

Harmful epidemics include flu and dengue fever in humans or bacterial wilt in beans. But epidemics don't always cause harm and some can be beneficial. Examples include viruses that protect their hosts, and social phenomenon such as new feeding techniques among birds and the adoption of the new agricultural technology in humans and so on. Nevertheless, little is known about the way beneficial epidemics spread.

Today that changes thanks to a group of researchers at the Santa Fe Institute in New Mexico who have studied the nature of beneficial epidemics in detail for the first time. Their work could have significant implications for individuals and organizations who hope to exploit beneficial epidemics and, of course, for those who might want to prevent them.

The Santa Fe group began by defining the unit of transmission in beneficial epidemics as the "bene" (pronounced BEN-ay). A bene can be a virus, a gene, a technology, a behavior, an idea and so on—anything that confers an advantage and can spread through a population.

This is a great initiative by Google - one wonders if other large organizations - including government - could enable this sort of internal capability.

> *Big 20% successes have included the development of Google News, Gmail, and AdSense. But there have been questions for years as to whether 20% time actually exists at Google at all anymore.*

Google has a new division called 'Area 120' where employees can build their own startups

http://www.businessinsider.com/google-is-building-an-in-house-startup-incubator-2016-4?mkt_tok=eyJpIjoiTnpSbU5EWmxNV05rWlRKbCIsInQiOiJCUDVSOU9odWxGXC9weUVDaXluTmEzWk9LV3RJc0tLbzNiK0hcL0dWcG50Vlp5UDdFOGlmbk1wRHk1N3FybVlxaEJmakw3N3JmanRpMEFtOUVHZ0FtbHZGMFEwa1wvVzVJellkTGJuQjdDYjVkMD0ifQ%3D%3D

Google is creating an in-house startup incubator to help keep its entrepreneurial talent closer to home, according to The Information.

The incubator is called “Area 120” and will be headed up by Google executives Don Harrison and Bradley Horowitz, sources told The Information.
Here’s how Area 120 will work:

- First, teams within Google will submit a business plan and apply to join Area 120.
- If successful, the teams will get to work full-time on their idea for a few months.
- They’ll then have the opportunity to pitch Google for additional funding and create a new company (which Google will invest in).

The name “Area 120” is a reference to Google’s famous “20% time.”

This is a long article by Kevin Kelly about the looming emergence of virtual reality technology. Perhaps a better term would be ‘Mixed Reality’ technology. The 4 min video is a **must view**. This is ‘Minority Report’ without the screens.

> *“Virtual reality overlaid on the real world in this manner is called mixed reality, or MR. (The goggles are semi-transparent, allowing you to see your actual surroundings.) It is more difficult to achieve than the classic fully immersive virtual reality, or VR, where all you see are synthetic images, and in many ways MR is the more powerful of the two technologies.”*
>
> *“But to really understand what’s happening at Magic Leap, you need to also understand the tidal wave surging through the entire tech industry. All the major players—Facebook, Google, Apple, Amazon, Microsoft, Sony, Samsung—have whole groups dedicated to artificial reality, and they’re hiring more engineers daily. Facebook alone has over 400 people working on VR. Then there are some 230 other companies, such as Meta, the Void, Atheer, Lytro, and 8i, working furiously on hardware and content for this new platform. To fully appreciate Magic Leap’s gravitational pull, you really must see this emerging industry—every virtual-reality and mixed-reality headset, every VR camera technique, all the novel VR applications, beta-version VR games, every prototype VR social world.”*
>
> *“Then you will understand just how fundamental virtual reality technology will be, and why businesses like Magic Leap have an opportunity to become some of the largest companies ever created.”*

The Untold Story of Magic Leap, the World’s Most Secretive Startup

http://www.wired.com/2016/04/magic-leap-vr/

THERE IS SOMETHING special happening in a generic office park in an uninspiring suburb near Fort Lauderdale, Florida. Inside, amid the low gray cubicles, clustered desks, and empty swivel chairs, an impossible 8-inch robot drone from an alien planet hovers chest-high in front of a row of potted plants. It is steampunk-cute, minutely detailed. I can walk around it and examine it from any angle. I can squat to look at its ornate underside. Bending closer, I bring my face to within inches of it to inspect its tiny pipes and protruding armatures. I can see polishing swirls where

the metallic surface was “milled.” When I raise a hand, it approaches and extends a glowing appendage to touch my fingertip. I reach out and move it around. I step back across the room to view it from afar. All the while it hums and slowly rotates above a desk. It looks as real as the lamps and computer monitors around it. It’s not. I’m seeing all this through a synthetic-reality headset.

Intellectually, I know this drone is an elaborate simulation, but as far as my eyes are concerned it’s really there, in that ordinary office. It is a virtual object, but there is no evidence of pixels or digital artifacts in its three-dimensional fullness. If I reposition my head just so, I can get the virtual drone to line up in front of a bright office lamp and perceive that it is faintly transparent, but that hint does not impede the strong sense of it being present.

This, of course, is one of the great promises of artificial reality—either you get teleported to magical places or magical things get teleported to you. And in this prototype headset, created by the much speculated about, ultra secretive company called Magic Leap, this alien drone certainly does seem to be transported to this office in Florida—and its reality is stronger than I thought possible.

This is a key capacity that has to become a generalized design principle of organization architecture. A **must read** for everyone interested in increasing organizational effectiveness in times of change in the conditions of change.

Special Operations Forces: A Global Immune System?

http://www.necsi.edu/research/military/sof.html?utm_source=Complexity+Digest&utm_campaign=ab009550e0-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_f55ea67de1-ab009550e0-67211845

The use of special operations forces (SOF) in war fighting and peace keeping efforts has increased dramatically in recent decades. A scientific understanding of the reason for this increase would provide guidance as to the contexts in which SOF can be used to their best effect. Ashby's law of requisite variety provides a scientific framework for understanding and analyzing a system's ability to survive and prosper in the face of environmental challenges. We have developed a generalization of this law to extend the analysis to systems that must respond to disturbances at multiple scales. This analysis identifies a necessary tradeoff between scale and complexity in a multiscale control system. As with Ashby's law, the framework applies to the characterization of successful biological and social systems in the context of complex environmental challenges. Here we apply this multiscale framework to provide a control theoretic understanding of the historical and increasing need for SOF, as well as conventional military forces. We propose that the essential role distinction is in the separation between high complexity fine scale challenges as opposed to large scale challenges. This leads to a correspondence between the role SOF can best serve and that of the immune system in complex organisms--namely, the ability to respond to fine-grained, high-complexity disruptors and preserve tissue health. Much like a multicellular organism, human civilization is composed of a set of distinct and heterogeneous

social tissues. Responding to disruption and restoring health in a system with highly diverse local social conditions is an essentially complex task. SOF have the potential to mitigate against harm without disrupting normal social tissue behavior. This analysis suggests how SOF might be leveraged to support global stability and mitigate against cascading crises.

This is another article from Yaneer Bar Yam related at the military but applicable to anyone or any organization that spends any time developing strategy for operations, products or the future.

Military Strategy in a Complex World

http://www.necsi.edu/research/military/strategy.html?utm_source=Complexity+Digest&utm_campaign=ab009550e0-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_f55ea67de1-ab009550e0-67211845

A strategy is a plan, method, or series of actions for obtaining a specified goal. A military strategy typically employs the threat or use of military force to advance goals in opposition to an adversary, and is called upon where large scale force is viewed as the way to achieve such goals. Strategic thinking is traditionally focused on which part or combination of land, air, and naval forces is most effective. This may be too narrow an approach to accomplishing the ultimate end, which is generally political influence or control—or preventing influence or control by others—and almost never consists of physical destruction itself. In order to broaden the discussion of military strategy, we consider here three distinct effects of inflicting stress on an opponent: a) A fragile system is damaged—possibly catastrophically, b) A robust system is largely unaffected, retaining much or all of its prior strength, c) Some systems actually gain strength, a property which has recently been termed antifragility. Traditional perspectives of military strategy implicitly assume fragility, limiting their validity and resulting in surprise, and assume a specific end state rather than an overall condition of the system as a goal. Robustness and antifragility are relevant both to offense, in attacks against the enemy, and defense, in meeting attacks against one's own forces. While robustness and antifragility are desirable in friendly systems, an enemy possessing these characteristics undermines the premise that an attack will achieve a desired increase in control. Historical and contemporary examples demonstrate the failure of traditional strategies against antifragile enemies—even devastating damage inflicted upon nations or other organizations did not weaken and defeat them, but rather strengthened them, resulting in their victory. Underlying such successful responses are socio-economic or political strengths. Our discussion is a basis for scientific analysis of the historical and contemporary conditions under which distinct types of strategies will be successful and provides guidance to improved strategic thinking.

This is a MUST READ for social scientist and anyone interested in social physics and the psychology of cooperation, competition within organizations and between teams. Games provide glimpse of how real-time data about

real-time experiments enable organizations to understand the implications of their policies and to develop effective engagement and incentives.

> *Riot has an internal institutional review board that evaluates the ethics of all its experiments. Although not a conflict-free arrangement, it at least suggests that the research is being reviewed with an eye towards participant protection. Academic collaborators also need to get approval from their local boards.*
> *Lin has lofty goals for his teams' research and interventions. "Can we improve online society as a whole? Can we learn about how to teach etiquette?" he asks. "We're not an edutainment company. We're a games company first, but we're aware of how it could be used to educate."*

Can a video game company tame toxic behaviour?

http://www.nature.com/news/can-a-video-game-company-tame-toxic-behaviour-1.19647?utm_source=Complexity+Digest&utm_campaign=9d5607c704-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_f55ea67de1-9d5607c704-67211845

Scientists are helping to stop anti-social behaviour in the world's most popular online game. The next stop could be a kinder Internet.

Online gamers have a reputation for hostility. In a largely consequence-free environment inhabited mostly by anonymous and competitive young men, the antics can be downright nasty. Players harass one another for not performing well and can cheat, sabotage games and do any number of things to intentionally ruin the experience for others — a practice that gamers refer to as griefing.

League of Legends has 67 million players and grossed an estimated US$1.25 billion in revenue last year. But it also has a reputation for toxic in-game behaviour, which its parent company, Riot Games in Los Angeles, California, sees as an obstacle to attracting and retaining players. So the company has hired a team of researchers to study the social — and antisocial — interactions between its users. With so many players, the scientists have been able to gather vast amounts of behavioural data and to conduct experiments on a scale that is rarely achieved in academic settings.

Daphné Bavelier, a cognitive neuroscientist at the University of Geneva in Switzerland, met Lin at the conference in New York City. Her research has suggested — to the joy of many gamers and the agony of their parents — that some games, particularly fast-paced first-person shooters, can improve a handful of cognitive abilities, such as visual attention, both within and outside the games2. She plans to collaborate with Riot to study how players tackle the steep learning curve in *League of Legends*.

The team-based nature of the game could also be useful to scientists. Young Ji Kim, a social scientist at the Massachusetts Institute of Technology's Center for Collective Intelligence, was able to recruit 279 experienced teams from *League of Legends* to fill out surveys and work together on a battery of online tests that were designed to explore team dynamics and the factors that make teams successful. (By providing an in-game incentive worth about $15, Riot helped her team to get thousands of sign-ups in a couple of hours, she says.) The preliminary results suggested that the teams' rank in the game correlates with their collective intelligence — a measure

that generally tracks with things such as social perceptiveness and taking equal turns in conversation.

This is another longish article - but well worth the read for anyone who is interested in understanding the blockchain technology (the platform supporting the Bitcoin and other crypto-currencies) and the implications for enabling some profound institutional revolutions.

> *"This is possibly the most significant and detailed record in all history, an open-source structure of permanent memory, which grows organically. It is known as the blockchain. It is the breakthrough tech behind the digital cash system, Bitcoin, but its impact will soon be far wider than just alternative money."*

In proof we trust

https://aeon.co/essays/how-blockchain-will-revolutionise-far-more-than-money

Blockchain technology will revolutionise far more than money: it will change your life. Here's how it actually works

The impact of record-keeping on the course of history cannot be overstated. For example, the act of preserving Judaism and Christianity in written form enabled both to outlive the plethora of other contemporary religions, which were preserved only orally. William the Conqueror's Domesday Book, compiled in 1086, was still being used to settle land disputes as late as the 1960s. Today there is a new system of digital record-keeping. Its impact could be equally large. It is called the blockchain.

Imagine an enormous digital record. Anyone with internet access can look at the information within: it is open for all to see. Nobody is in charge of this record. It is not maintained by a person, a company or a government department, but by 8,000-9,000 computers at different locations around the world in a distributed network. Participation is quite voluntary. The computers' owners choose to add their machines to the network because, in exchange for their computer's services, they sometimes receive payment. You can add your computer to the network, if you so wish.

All the information in the record is permanent – it cannot be changed – and each of the computers keeps a copy of the record to ensure this. If you wanted to hack the system, you would have to hack every computer on the network – and this has so far proved impossible, despite many trying, including the US National Security Agency's finest. The collective power of all these computers is greater than the world's top 500 supercomputers combined.

New information is added to the record every few minutes, but it can be added only when all the computers signal their approval, which they do as soon as they have satisfactory proof that the information to be added is correct. Everybody knows how the system works, but nobody can change how it works. It is fully automated. Human decision-making or behaviour doesn't enter into it.

At the turn of the 20th Century Einstein introduced the world to relativity - yet most of us continue to live in and perceive a Newtonian world - we say, 'look the sun is going down'. This is must read paper - not because we know he's right but because we don't know if he's wrong. Most important for all of us and for social science - is that we must begin to grasp the implications of living in a quantum reality.

> *"There's a metaphor that's only been available to us in the past 30 or 40 years, and that's the desktop interface. Suppose there's a blue rectangular icon on the lower right corner of your computer's desktop — does that mean that the file itself is blue and rectangular and lives in the lower right corner of your computer? Of course not. But those are the only things that can be asserted about anything on the desktop — it has color, position and shape. Those are the only categories available to you, and yet none of them are true about the file itself or anything in the computer.*
>
> *They couldn't possibly be true. That's an interesting thing. You could not form a true description of the innards of the computer if your entire view of reality was confined to the desktop. And yet the desktop is useful. That blue rectangular icon guides my behavior, and it hides a complex reality that I don't need to know. That's the key idea. Evolution has shaped us with perceptions that allow us to survive. They guide adaptive behaviors. But part of that involves hiding from us the stuff we don't need to know. And that's pretty much all of reality, whatever reality might be. If you had to spend all that time figuring it out, the tiger would eat you."*

The Evolutionary Argument Against Reality

https://www.quantamagazine.org/20160421-the-evolutionary-argument-against-reality/

The cognitive scientist Donald Hoffman uses evolutionary game theory to show that our perceptions of an independent reality must be illusions.

As we go about our daily lives, we tend to assume that our perceptions — sights, sounds, textures, tastes — are an accurate portrayal of the real world. Sure, when we stop and think about it — or when we find ourselves fooled by a perceptual illusion — we realize with a jolt that what we perceive is never the world directly, but rather our brain's best guess at what that world is like, a kind of internal simulation of an external reality. Still, we bank on the fact that our simulation is a reasonably decent one. If it wasn't, wouldn't evolution have weeded us out by now? The true reality might be forever beyond our reach, but surely our senses give us at least an inkling of what it's really like.

Not so, says Donald D. Hoffman, a professor of cognitive science at the University of California, Irvine. Hoffman has spent the past three decades studying perception, artificial intelligence, evolutionary game theory and the brain, and his conclusion is a dramatic one: The world presented to us by our perceptions is nothing like reality. What's more, he says, we have evolution itself to thank for this magnificent illusion, as it maximizes evolutionary fitness by driving truth to extinction.

Getting at questions about the nature of reality, and disentangling the observer from the observed, is an endeavor that straddles the boundaries of neuroscience and fundamental physics. On one side you'll find researchers scratching their chins raw trying to understand how a three-pound lump of gray matter obeying nothing more than the ordinary laws of physics can give rise to first-person conscious experience. This is the aptly named "hard problem."

It looks like the frontier of domesticating DNA is an accelerating horizon as both the tools exponentially improve and the cost exponentially decreases.

> *"CRISPR JUST WENT FROM HANDLING DNA LIKE A MEAT CLEAVER — TO HANDLING IT LIKE A SCALPEL"*

Breakthrough method means CRISPR just got a lot more relevant to human health

http://www.theverge.com/2016/4/20/11450262/crispr-base-editing-single-nucleotides-dna-gene-liu-harvard

'The most clever CRISPR gadget to date'

The gene-editing tool CRISPR may one day change the way humans approach medicine — or at least that's how it's been portrayed so far. But for all the talk of using CRISPR to eliminate disease, the method was never very good at doing one important thing: altering single letters of DNA. (DNA is made of four chemical units, represented by the letters A, T, G, and C.) Now, scientists at Harvard University say they've modified the CRISPR method so it can be used to effectively reverse mutations involving changes in one letter of the genetic code. That's important because two-thirds of genetic illness in humans involve mutations where there's a change in a single letter.

The new method, described today in Nature, is called the "base-editing technique." It relies on the same basic mechanism as the standard CRISPR method, but unlike its predecessor, it doesn't need to cut both strands of the DNA double-helix to alter the genetic code. Instead, the technique can directly convert a single letter of DNA to another, without deleting and inserting a bunch of random letters in the process. Because of this, the researchers were able to genetically alter human cells and mouse cells to reverse single-letter mutations that are associated with late-onset Alzheimer's and breast cancer.

Here is a great is a great example of domestication of DNA via our capacity to edit.

> *Kamel Khalili explains, "[Our findings] demonstrate the effectiveness of our gene editing system in eliminating HIV from the DNA of CD4 T-cells and, by introducing mutations into the viral genome, permanently inactivating its replication. Further, they show that the [gene-editing] system can protect cells from reinfection and that the technology is safe for the cells, with no toxic effects."*

Scientists have removed HIV from human immune cells using a new gene-editing technique

http://www.sciencealert.com/scientists-have-removed-hiv-dna-from-human-immune-cells-using-new-gene-editing-technique

They've managed to shut down HIV replication permanently.

This is a development that will have profound impact on our understanding of our bio-cognitive processes - a deeper capacity to see how brains work.

> *"This represents a completely new class of molecules that doesn't look anything at all like what people thought could be made into MRI tags,"*

New Class of Molecular 'Lightbulbs' Illuminate MRI

https://today.duke.edu/2016/03/hyperpolarizationmri

Discovery could enable cheaper, more versatile bioimaging

Duke University researchers have taken a major step towards realizing a new form of MRI that could record biochemical reactions in the body as they happen.

In the March 25 issue of Science Advances, they report the discovery of a new class of molecular tags that **enhance MRI signals by 10,000-fold and generate detectable signals that last over an hour**. The tags are biocompatible and inexpensive to produce, paving the way for widespread use of magnetic resonance imaging (MRI) to **monitor metabolic processes of conditions like cancer and heart disease in real time**.

Just how much land has to be dedicated to Solar in order to provide the U.S. with the energy it needs?

The Amount Of Land Required To Run America On Solar Power Is Shockingly Small

https://www.good.is/infographics/solar-power-all-of-america

It only takes .6 percent of the country to fuel the United States

Just 11,200,000 acres to generate 4,000,000 GWh of clean energy?
Well, all right! Problem solved! Let's just fill that area with solar panels and call it a day… right?

That would be great, but unfortunately the answer isn't so simple as staking a bunch of panels across 12 million acres and calling it a day. First of all, that 11.2 million acres will expand quickly once things like service roads, operational facilities and transmission lines are incorporated. And then there's the fact that you can't just build one massive solar array and walk away. Solar capture areas would have to be distributed over a wide area to avoid the problem of cloudy days or storms or other weather events that would obscure the sun pouring down onto you energy farm.