Thought experiments need not be literal. They don't have to be confined to what already is or even what's possible. The scientist, when considering the perspective of the fish, can also imagine the boat as being made of glass and the water as easy to see through as air. Or he need not limit the experiment to the visual perspective of the fish. After all, we don't gain perspective only with our eyes, but through the lens of our experiences, biases, desires, and more.

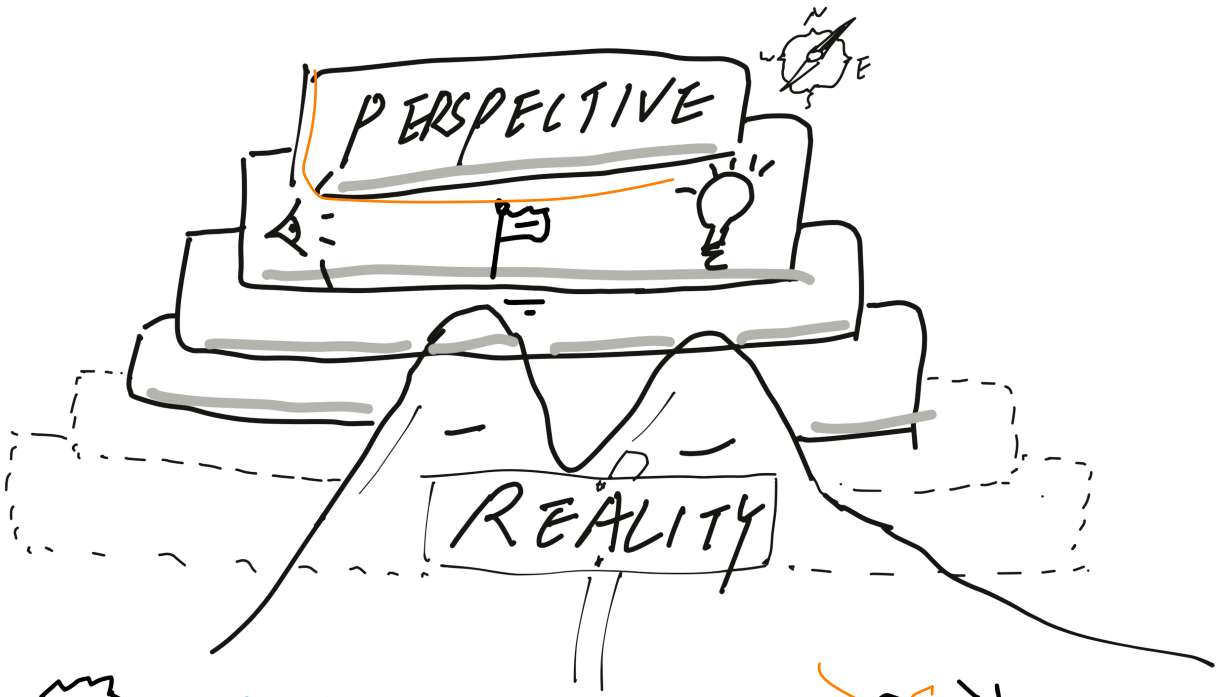
When you see someone doing something that doesn't make sense to you, ask yourself what the world would have to look like to you for those actions to make sense. While we all see our own version of events, the goal is to enlarge our perspective to be a closer representation of reality by removing some of the factors that cloud our judgment. One of the best ways to do this is by noticing and observing the details of what is going on around you.

Conclusion

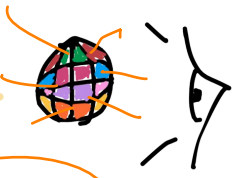
In the physical world, there is subjectivity of perception partly because everything is moving relative to everything else. Back to Einstein's scenario, both the lightning and the train are moving relative to the location of each observer. Our perspective has similar complexity.

What matters is understanding the complexity and value of multiple perspectives. No one sees it all. Multiple perspectives layered together reduce blind spots and offer us a more textured and truer sense of the underlying reality. Furthermore, we are constantly confounded by the unknown which we must somehow make sense of through the lens of our own experience.

We all get stuck, frustrated when no one seems to understand us, or angry that we aren't making progress based on how we understand the world. This is when it is most helpful to remember relativity and refresh our perspective by stepping outside of ourselves for a little bit.



1 Reality is negotiable



2 Thoughtful opinions held loosely

3 Rashomon effect

↓

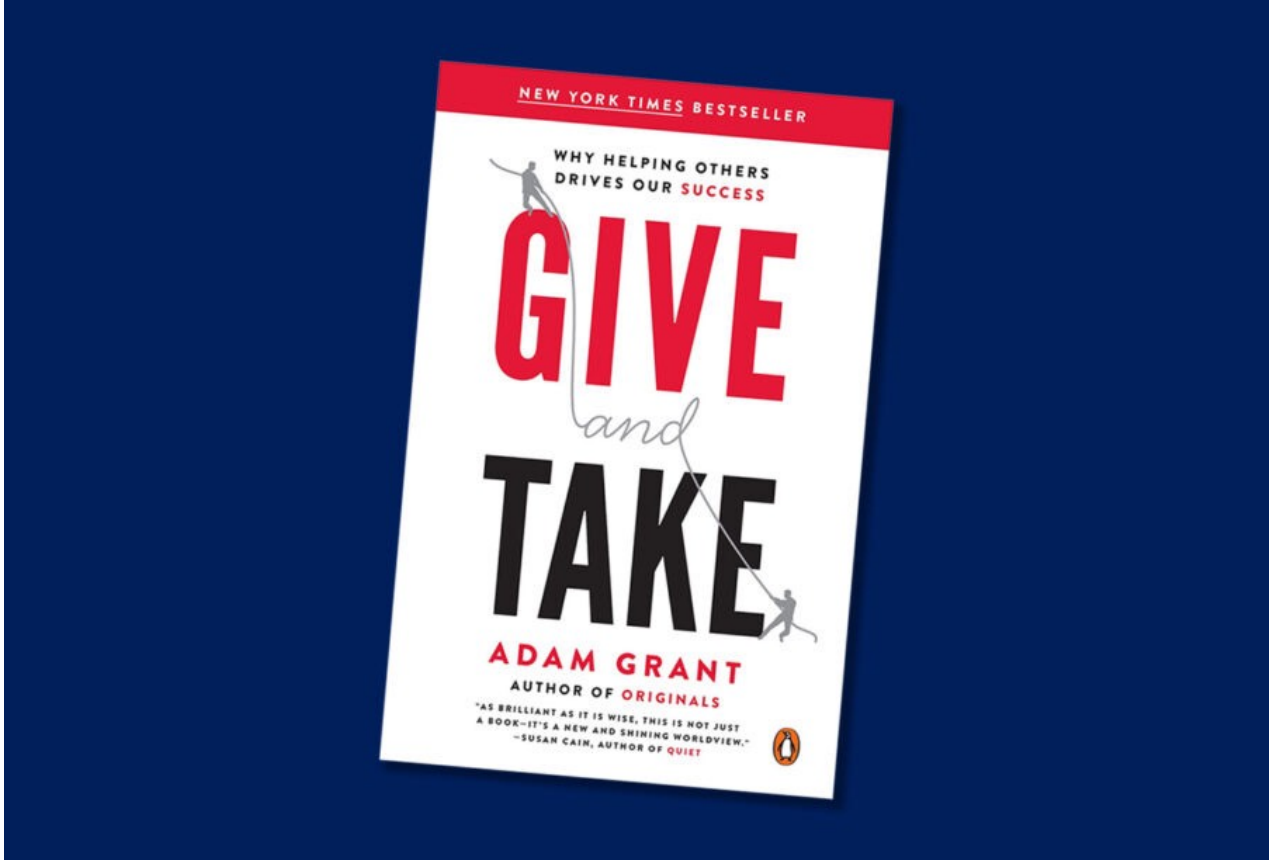
multiple perspectives

Physics

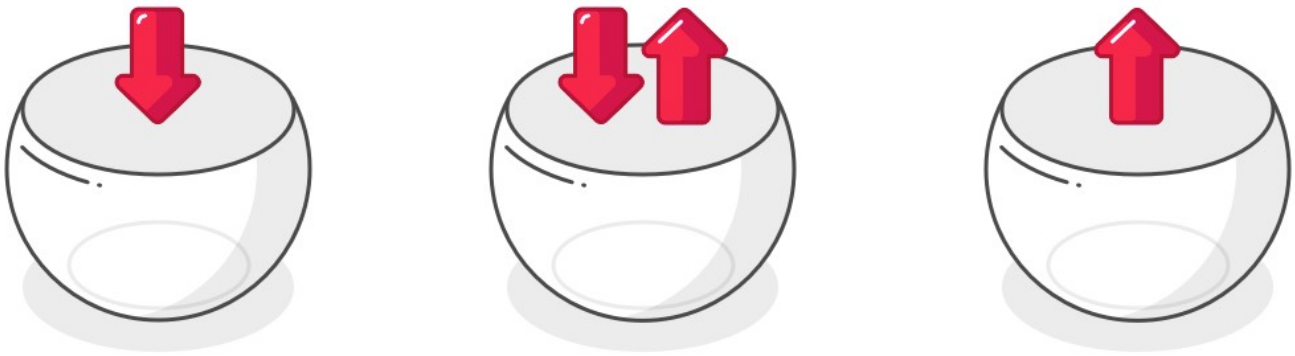
Reciprocity

–

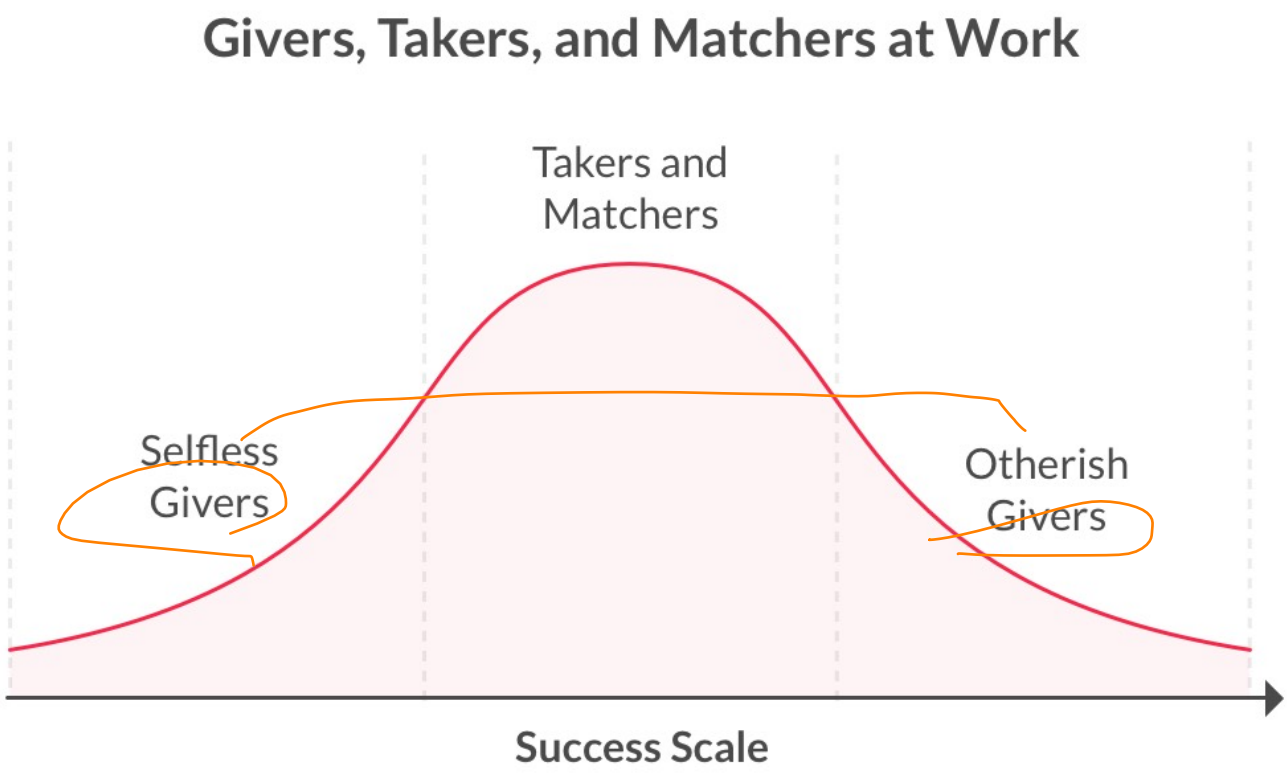
Give and take.



The Three Reciprocity Types



Takers | Matchers | Givers



In addition, givers may get more support from fellow colleagues on their way up to success. “There’s something distinctive that happens when givers succeed: it spreads and cascades. When takers win, there’s usually someone else who loses. Research shows that people tend to envy successful takers and look for ways to knock them down a notch. In contrast, when givers (…) win, people are rooting for them and supporting them, rather than gunning for them. Givers succeed in a way that creates a ripple effect, enhancing the success of people around them.”

Most people assume that self-interest and other-interest are opposite ends of one continuum. Yet in my studies of what drives people at work, I've consistently found that self-interest and other-interest are completely independent motivations: you can have both of them at the same time. As Bill Gates argued at the World Economic Forum, "there are two great forces of human nature: self-interest, and caring for others," and people are most successful when they are driven by a "hybrid engine" of the two. If takers are selfish and failed givers are selfless, successful givers are otherish: they care about benefiting others, but they also have ambitious goals for advancing their own interests.

Selfless giving, in the absence of self-preservation instincts, easily becomes overwhelming. Being otherish means being willing to give more than you receive, but still keeping your own interests in sight, using them as a guide for choosing when, where, how, and to whom you give. Instead of seeing self-interest and other-interest as competing, the Caring Canadians found ways to integrate them, so that they could do well by doing good. As you'll see, when concern for others is coupled with a healthy dose of concern for the self, givers are less prone to burning out and getting burned—and they're better positioned to flourish.

How to be a smart giver

If your goal is moderate success, you can decide to act like a taker or a matcher. But if you want to be part of the top performing members of your organization, or to have a positive impact on the world and foster win-win-win relationships with people around you, you may want to try to become a smart giver.

- **Change your mindset.** Consider the lens through which you are viewing your job and your relationships with friends and family. For your professional context, ask yourself who exactly is affected by your work? How do your choices impact the experience of colleagues *and* customers? How can you align your decisions so when you win, everyone wins? Instead of being self-focused like a taker or transactional like a matcher, think of an expanding pie where everyone can benefit from your success.
- **Help wisely.** A problem low-performance givers face is the lack of focus on the way they give. Tracking your impact does not mean you need to become a taker and only help when it benefits you, nor that you need to become a matcher and only help when you receive equal value in return. Rather, it means that you need to make sure you are helping achieve goals that are beneficial in general, not only to the person you are helping. Ask yourself: is this good for the company, for

How to be a successful giver

1. 5-minute favors

What to do:

Do other people small favors that take no more than 5 minutes – like making an introduction, giving feedback, and offering advice.

Why it works:

Made famous by serial entrepreneur Adam Rifkin, 5-minute favors are those small yet impactful favors you do for others that take no more than 5 minutes. Doing these quick favors for a coworker or friend can go a long way in strengthening your relationships.

2. Ask for help

What to do:

Ask a friend or coworker for help on an issue you're having, without taking up too much of their time.

Why it works:

While asking for help doesn't sound like a quintessential giver move, doing so comes with some surprising benefits. It gives them the opportunity to be a giver, but also makes them feel good and smart.

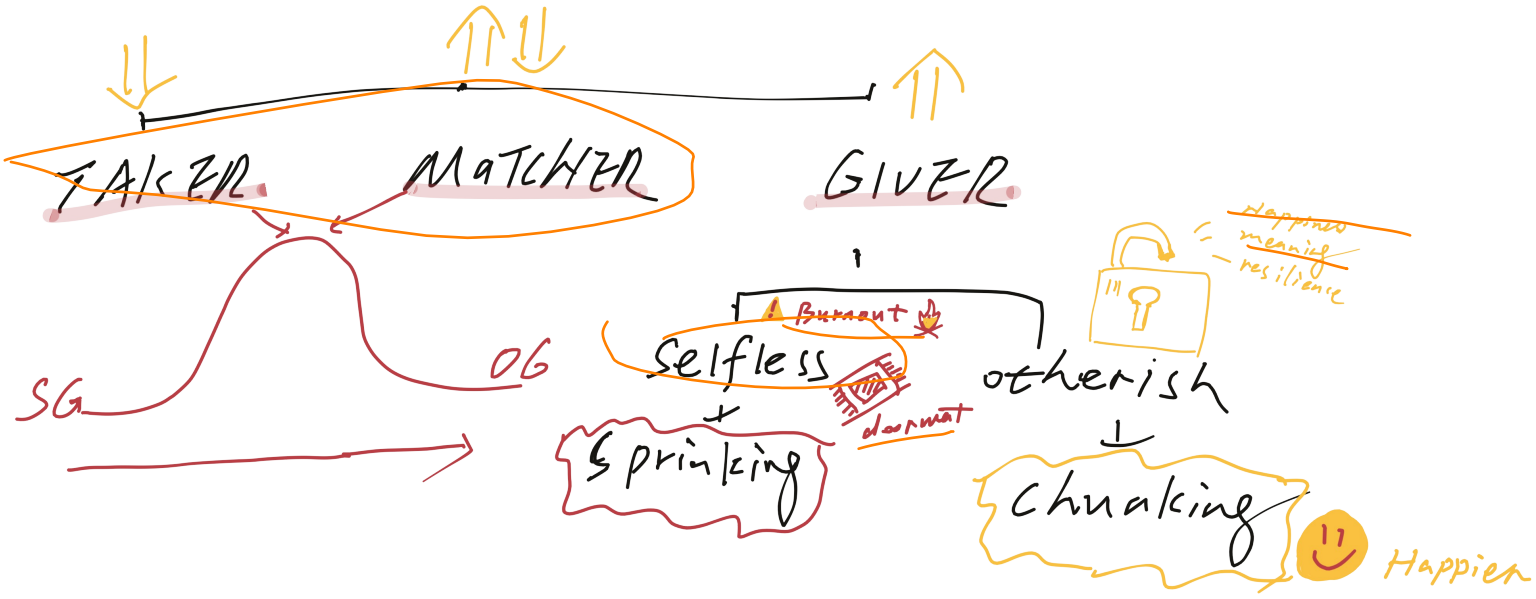
According to Grant, one of the best ways to build strong relationships is to seek advice, because it creates meaningful opportunities for someone to contribute to your life, and feel fulfilled by it.

> **5. Keep an eye out for takers**
>
> **What to do:**
>
> Spot takers early, based on reputation and past experience, and only help them if they like you.
>
> **Why it works:**
>
> Takers like to milk givers for favors, because of givers' reputations. To avoid this, take on the mentality of a matcher. In other words, if a taker asks for help, say *"sure, I'll help you if you agree to help me with something else in return."*

Give, give, give!

Practice these tips and tricks, and you'll be a successful giver in no time. But the key to being a successful giver is also being an authentic giver. The less you try to give to get, the more you'll succeed.

Check out the next article in our Givers, Takers, Matchers series, where we explore how these reciprocity styles affect not only individuals, but also industries.


TAKER
MATCHER
GIVER
SG
OG
Selfless
Burnout
doormat
otherish
Sprinkling
Chunking
Happiness
meaning
resilience
Happier

Reciprocity

Reciprocity teaches us why win-win relationships are the way to go, why waiters leave candies with the bill, why it's a good idea to use the least force possible to secure an outcome, and why a lot of companies don't permit their employees to accept gifts. This model demonstrates why we should view giving as being as valuable as having. It prompts us rewrite the Golden Rule to say, "Do unto others knowing that something will be done unto you." So what exactly is reciprocity?

In physics, reciprocity is Newton's third law, which states that for every force exerted by object A on object B, there is an equal but opposite force exerted by object B on object A. Every force involves the interaction of two objects where the force asserted by one is reciprocated with an equally powerful and directionally opposite force by the other object. Forces always occur in pairs of the same type of force, and it is not possible for one object to exert a force without experiencing a reciprocal force.

When I land on the ground after jumping, I am exerting a force on the ground. At the moment of landing, the ground is also applying a force that is equal but opposite in direction on me. The earth applies a force on me even when I am just standing. This force is gravity. But the gravitational force exerted on me by Earth is reciprocated by me through the force I am exerting on the earth.

In the natural world, this third law of Newton's explains jet propulsion. The word *propulsion* comes from two Latin terms meaning "forward" and "drive"—propulsion is a force that drives an object forward.[1] Jet propulsion works by forcing matter, such as

gas produced by burning fuel, in one direction, leading to a corresponding movement of the vehicle in the opposite direction. This holds true for everything from fireworks and guns to huge spacecrafts.

Jet propulsion only works if the forward push is stronger than the forces acting on the object, like air friction and its own weight. The greater the force in comparison to drag (the amount of force opposing the motion), the faster the object can move. Octopi and squid force water through their mantle and out through a siphon at a high speed that compensates for their weight and the viscosity of the water. As the animal asserts a force on the water, the water exerts a force on the animal, and this makes the octopus or squid move.

Consider the tackle in American football. The force that the defender puts on the receiver's body in order to bring him to the ground is equivalent to the force felt by the defenseman's body during the tackle. You can't initiate force without having a force put on you. For the tackle, this is very important. If the defenseman felt nothing there would be no incentive for him to be strategic in the application of his force on the receiver. And who would actually want to be a receiver if this were the case? If the guy who initiates the force feels nothing—much better to be him.

Since this is not the case, the tackle is more about using the least amount of force required to bring the receiver to the ground. It's better for the receiver, and it's also better for the guy doing the tackling, because the more force you apply to others, the more damage you do to yourself. Reciprocity can be summed up like this: when you act on things, they act on you.

— Sidebar: Quid pro quo

« For every action, there is an equal and opposite reaction. »

Newton’s Third Law

What we give

It would be amazing if every time you did something good for the world, you received a corresponding amount of positive effect in your life. We all know that unfortunately this is not true. Sometimes positive intentions produce negative results, or bad things happen to people who do good things for others. Although the connection between good deeds and a good life isn't perfect, there is a documented relationship between the two. Using the model of reciprocity can help us understand why people benefit themselves when they work for what they believe is good. The life of Norman Bethune, * a Canadian surgeon, is one that can teach us a lot about the nuances of reciprocity.

Quid pro quo

Sometimes, if you want to understand how pervasive a concept is, you can look at the vernacular of a society. English speakers from Commonwealth countries have many expressions that suggest the basics of reciprocity are foundational for how we expect our society to function. "Quid pro quo," Latin for "something for something," appeared in regular usage in the 16th century. We also have "give and take," "tit for tat," and "if you scratch my back, I'll scratch yours." The meaning behind these expressions, which implies an expectation of reciprocity, is perhaps best summed up by another Latin phrase: "do ut des," translated as, "I give, so that you may give."

Bethune was not a volunteer in the sense we often use the term now to describe activities that are an adjunct to daily life. His efforts to help others were completely integrated into his work and life. What made him a volunteer is that he did it of his own volition, at no obvious personal benefit. Therefore, his story provides an interesting example to really explore reciprocity. What do you get when you give? What kind of tensions are created when the two forces interact?

Norman Bethune grew up wanting to be a surgeon, inspired by his doctor grandfather. He completed his studies during the First World War, during which he also volunteered providing medical support on the battlefield. During the 1920s he practiced medicine

in the United States and Canada, eventually settling in Montreal. He initially specialized in thoracic surgery and developed a solid reputation as a surgeon. However, he had an ongoing commitment to help people beyond what he did in his practice. This goal he pursued in a variety of ways.

During the early 1930s, while in Montreal, Bethune provided medical services free to the poor and established a free-of-charge clinic he ran once per week. He vocally advocated for universal health protection, explaining that many medical issues were created by poverty and negligent employers. In addition, and unique for the time, he used radio broadcasts to educate the public on tuberculosis. Bethune volunteered his time, energy, and intelligence to try to bring about meaningful improvements in the lives of the most impoverished. [2]

During the 1930s he became a supporter of communism and joined the Communist Party, mostly on account of what he saw of the benefits of the Soviet socialized health care system. These political beliefs took him further afield in his efforts to improve access to and outcomes in healthcare.

In 1936 in Spain during the Spanish Civil War, Bethune designed and developed the first ever mobile blood transfusion unit. This vehicle could draw and store blood, was used to give transfusions, and most importantly, could be used on the front lines of the battlefield. It was a remarkable innovation that saved countless lives and inspired the medical approach used in World War II.

All of the work that Bethune did in Spain, and later China, was not for profit. The mobile blood unit and all his other surgical

innovations and inventions did not make Bethune any money.[3]

In 1938 Bethune went to China, desiring again to help people. China was fighting a war with the Japanese, the Sino-Japanese War, and Bethune's belief in communism led him to deploy his efforts in support of [redacted] He was made commander of all Chinese medical forces and immediately set about modernizing the existing primitive health care in China.

Helping the Chinese in their fight, he again deployed his practice of bringing the surgeon to the battlefield, designing mobile operating equipment and improving the survival rate of the injured. He also extensively trained doctors and nurses and established hospitals in areas that had neither. In their article, "The Medical Life of Norman Bethune," Deslauriers and Goulet write, "His courage, determination and will to fully employ his talents of ingenuity, aggressiveness and selfless response to social concerns when the time came is truly remarkable."[4] He accomplished so much in his 18 months in China that when he died of septicemia after operating on a soldier, Mao delivered his eulogy, describing him as "a man who is of value to the people."[5]

Bethune's achievements continue to be regarded as heroic by the Chinese. The first hospital he founded still exists, and his story is mandatory learning for primary school students in China.

Bethune's story, however, is not solely one of accolades and recognition, heaps of positive effects achieved as a result of a life spent trying to bring about good. He died at age 49 as a direct result of his efforts to improve health outcomes on the battlefield. The fact that he was a communist led him to be written out of Canadian

history during the Cold War years, when communism was seen as a direct threat to Western democracy. His personal life wasn't great, and his aggressive personality earned him enmity from many colleagues.

Normally one would talk about a life like Norman Bethune's in terms of sacrifice. He sacrificed personal relationships, social acceptance, and ultimately his life in order to take actions in accord with his beliefs and values. But using the lens of reciprocity suggests there is another way to interpret the story.

In a paper on the health benefits of volunteering in adults, the authors explain, "The beneficial effects of volunteering on health outcomes have been well documented. Research has found that participation in voluntary services is significantly predictive of better mental and physical health, life satisfaction, self-esteem, happiness, lower depressive symptoms, psychological distress, and mortality and functional inability."[6] Multiple studies have demonstrated the positive consequences of volunteering that are conferred on the volunteer. We may volunteer for a variety of reasons, based on our interests, goals or values, but regardless, we reap health benefits when we do so.

The studies on the positive aspects of volunteering for the volunteer bring to mind the concepts we outlined above in the science of reciprocity, like how forces always occur in pairs. Although volunteering is not governed by the laws of physics, using reciprocity as a metaphor can help us understand why volunteering appeals to so many people. And consequently, why some people make the choice to help others at seemingly great cost to themselves.

The research on volunteering makes it clear that when we give, we get. We improve our physical health; we feel better about ourselves and our place in the world. We evaluate our lives as having more meaning. One way of understanding people who take the kinds of actions that Bethune did, which on their face seem to risk so much, is that they receive a benefit from the world proportional to what they put out there. It's not a benefit that can always be measured in legacy or reward. Sometimes those things come; for Bethune, although North America struggled for decades to appreciate him as the dedicated medical innovator he was on account of his political views, China continues to go all out in its appreciation of his contributions to their country.

However, perhaps the benefit is better conceptualized as the reciprocity received by the individual in terms of the satisfaction they have regarding the choices they've made. The act of doing good causes an equal reaction in terms of feeling good. In reading Bethune's story it is clear that he was not motivated by recognition, but rather a genuine desire to help people that gave him an exceptional amount of energy and drive. It is highly possible that he didn't evaluate his life as one of sacrifice, but instead derived satisfaction from his efforts.

— Sidebar: Tit for Tat

« Many, many men have been just as troubled morally and spiritually as you are right now. Happily, some of them kept records of their troubles. You'll learn from them—if you want to.

Just as someday, if you have something to offer, someone will learn something from you. It’s a beautiful reciprocal arrangement. »

J.D. Salinger [7]

Tit for Tat

Tit for tat is a strategy which, according to game theory, is the most effective choice for iterated games based on mutual cooperation or defection. Both players benefit if they cooperate, but one benefits and the other loses out if only they defect, and both lose out to a lesser extent if they simultaneously defect. As abstract as such games sound, they have important implications for understanding everything from group selection in biology to cooperation in economics. Under tit for tat, a player will begin by cooperating, then in subsequent iterations will replicate whatever their opponent did last time. So if their initial cooperation is punished with defection, they will then reciprocate in kind. In games that are not iterated and only consist of a single round, defection is thought to be the best strategy.

Tit for tat was codified as a game theory strategy by mathematical psychologist Anatol Rapoport, but it builds upon our instinctual notions of reciprocity. It teaches us that our best option when dealing with other people we cannot trust entirely is to reciprocate their choices. Seeing as we can rarely place full trust in anyone, especially if they stand to gain by screwing us over, we lean toward tit for tat. In general, we view this as fair and just. If someone helps us, we're quite happy to assist them the next time they need help. But if they ignore our plight when we need help, we're highly unlikely to care in the inverse situation. For this reason, evolution tends to select for

cooperative behavior in groups—it benefits everyone in the long run.

However, straightforward tit for tat is not as effective as the strategy known as tit for tat with forgiveness. This strategy involves occasionally cooperating in the face of defection. It is easy for two opponents to get stuck in a cycle of mutual defection from which they cannot escape unless and until one decides to cooperate. If both are using tit for tat, a cycle of mutual cooperation will then commence.

Life is an iterative and compounding game. In the words of Peter Kaufman, it pays to "go positive and go first." Also, remember that people make mistakes. Assuming there is no maliciousness, it pays to forgive.

Loss Aversion

Loss aversion is one of the principles that govern the value of outcomes. Daniel Kahneman explains it like this: "When directly compared or weighted against each other, losses loom larger than gains." According to Kahneman, people are willing to risk losing $100 for every $250 of potential gains.[1] The loss aversion coefficient is 1:2.5.[2] This asymmetry between the power of positive and negative expectations or experiences has an evolutionary history. Organisms that treat threats as more urgent than opportunities have a better chance to survive and reproduce.[2] When it comes to reciprocity, we need to understand, "We are driven more strongly to avoid losses than to achieve gains."[3] This is why putting ourselves out there, engaging people who might dismiss or reject us, is so scary. Because in the one-off situation, the pain it will cause is perceived as stronger than the positive feelings of acceptance. The trick is to start looking at outcomes in the aggregate instead of focusing on each unique situation.

The rise of the "win-win"

In the physical world, the law of reciprocity works 100% of the time. The harder you punch a wall, the more force pushes against your fist, the more damage is caused to both you and the wall. In the biological world, reciprocity doesn't have the same perfect record. However, it has been discovered to work much more often than not, and thus harnessing it has significant long-term benefits.

Evolutionary biologists argue that our tendency to engage in reciprocal behavior is a natural product of evolution. You are more likely to survive if you receive help from others. And you are more likely to receive that help if you have offered assistance in the past. So the genes that encode the reciprocal instinct were more likely to be passed on. And thus the fact that the human species has made it to now is directly dependent on our building social interactions that are reliable, useful, and trustworthy.

Humans engage in two types of reciprocity with each other: direct, which is "I help you and you help me;" and indirect, which is either a pay-it-forward concept, "I help you and then you help someone else," or more about reputation building—"I help you, building a reputation as one who helps, so that someone else helps me in the future." Both kinds work.

— Sidebar: Loss Aversion

While reciprocity isn't as reliable when it comes to humans as it is with physics, the concept can help you achieve better outcomes. Sometimes we go first and go positive and get nothing back, as is the case if we smile at a stranger walking on the street. Most times they'll smile back at you, but every once in a while, you're met with a

scowl. We tend to forget the times our smile elicited a smile in response and remember the times when we received nothing in return, and so we stop smiling. However, the small loss we occasionally experience as a result of putting ourselves out there and not having it reciprocated is more than compensated for by the gains the rest of the time. If you want to get an idea of the true value of engaging in positive reciprocal behavior, just make a list of your outcomes in any given week. Life is easier and more enjoyable when we act on starting and maintaining win-win relationships with everyone. And as we explained, reciprocity has been part of our biological makeup for a very long time.

> « Tsze-Kung asked, "Is there one word with which to act in accordance throughout a lifetime?" The Master said, "Is not reciprocity such a word? What you do not want done to yourself, do not do to others." »
>
> **Confucius** [8]

Let's go back to the eastern Mediterranean around 1250 BCE. The bulk of the power in the region was held by the four kings of Egypt, Hatti (a region in present day Turkey), Assyria and Babylon. They didn't like each other much—in fact, "they deeply distrusted each other and frequently squabbled." [9] Demonstrating military prowess was often a way that a king achieved legitimacy in the eyes of his

subjects, and there were constant conflicts, from skirmishes to full-on battles between these four areas. Fighting was the norm.

Then, one day, as Trevor Bryce chronicles in his article on "The Eternal Treaty", 15 years after a “great military showdown” between the Egyptians and the Hittites, an interesting thing happened. The two kings decided to enter into the world’s first known peace treaty.

The treaty was not about peace in the global sense, stemming from a desire to have a world without war. It was about peace in the immediate sense; two parties trying to establish a mutually beneficial relationship. The treaty, known as the Eternal Treaty, was the laying out of a directly reciprocal relationship between two civilizations.

Egypt was led by Ramesses, whose primary goal was to build “monumental construction projects, and to build his kingdom’s wealth through trade and the exploitation of its mineral-rich regions.” [10] He had other security issues, most notably the Libyans to the west. So his interest in the treaty was to give himself some space to accomplish the legacy that mattered to him. The reality is, if you’re fighting with everyone all of the time you have to spread your resources along many fronts and you likely don’t have time to do anything else. One less border to defend was an opportunity to put his efforts elsewhere.

The Hittites had a similar problem, in a growing military threat from the Assyrians. In addition, their ruler Hattusili had usurped the throne from his nephew and was badly in need of some external power to legitimize his rule. Ramesses commanded great respect in the region, and his acknowledgment of Hattusili’s

leadership would go a long way to maintaining stability. In pursuing the treaty with Egypt, “his hope was that Ramesses’ endorsement of his own position, and by implication that of his lineal descendants, would provide some security against future challenges.” [11]

The treaty contained provisions for future military support, the kind of alliance in which an attack on one is an attack on the other. Assyria, despite having both interest and a good position did not, in fact, invade Hatti during Hattusili’s reign, so “quite possibly, the Egyptian-Hittite alliance did prove an effective deterrent against such an enterprise.” [12]

Reciprocity based on self-interest is still reciprocity. Engaging in positive behavior to then be a receiver of positive behavior is about the long game. For both Ramesses and Hattusili, the benefits of trying to develop an alliance were clear. It gave them both an opportunity to exit fighting that consumed resources and allowed them to focus those resources on long-term stability and their legacies. Over time, the likelihood of reciprocal interactions increases, and thus it’s a much better strategy to try to make them positive. The more people you help, the more people you will have willing to help you.

— Sidebar: Schadenfreude

Schadenfreude

Schadenfreude is a German word that has the literal translation of "damage-joy" and the more nuanced translation of delight or satisfaction at another person's misfortune or suffering. As Tiffany Watt-Smith writes in *Schadenfreude: The Joy of Another's Misfortune*,[1] equivalent concepts pop up in proverbs and words from numerous countries: France, Japan, Holland, Denmark, Israel, China, Russia, and Ancient Greece and Rome.

Schadenfreude is closely linked to our sense of reciprocity. We feel it strongest when someone's misfortune seems earned, as penance for their misdeeds. No one of sound mind would feel joy at the sight of an elderly lady tripping up in the street or a dog getting its paw stepped upon. But when a homophobic politician accidentally tweets a link to gay porn? That's when we feel a sense of glee and feel less need to hide it. Schadenfreude is not sadism—it's a normal feeling that ties to our evolutionary programming and sense of fairness. We even use it as a form of bonding.[2]

According to research, schadenfreude is tied to three things: aggression, rivalry, and justice.[3] First, our sense of belonging to a particular group leads us to feel aggression toward anyone outside our tribe. The misfortunes of those perceived as outsiders bring us satisfaction because we perceive it as benefiting our own group, even if it might not. Second, seeing things go wrong for other individuals gives us a

stronger sense of our own superiority because we look and feel better in comparison. We naturally position ourselves within hierarchies based on every possible quality and are highly sensitive to where we stand in relation to others. Any sign of their inferiority transpires to be a plus for us.[4] Status is always relative.

Finally, we experience schadenfreude when our sense of reciprocity is satisfied—when we feel someone deserves a comeuppance. We may not be willing or able to enact vengeance ourselves, but we're delighted when it seems the universe has done it for us. Sometimes we are content to bide our time until this happens, as our sense of reciprocity is so strong that we expect people to get what they deserve sooner or later. Research supports this, suggesting that we feel more schadenfreude when we think someone deserves misfortune.[5]

Conclusion

A lot of people seem to expect the world to just hand them things without putting in any effort. This is a poor strategy because it doesn't align with the human behavior you can observe around you every day. Reciprocation teaches us that if you give people cynicism and curtness or nothing at all, you are likely to receive the same. But if you give people opportunity and the benefit of the doubt, you will, more often than not, be on the receiving end of the same behavior.

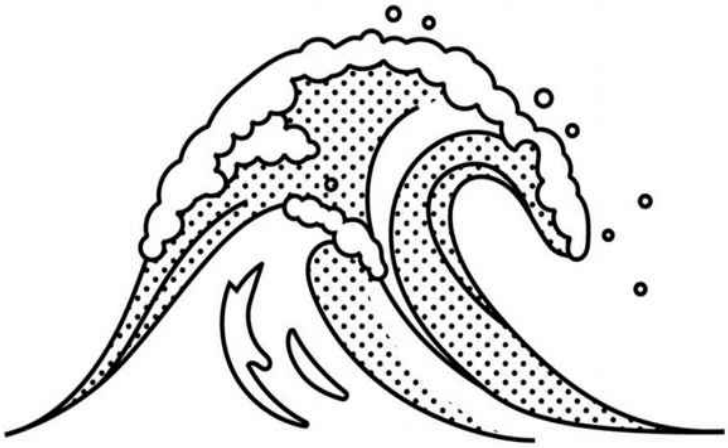
↳ Become what you want to see in the world and it will be so. If you want an amazing relationship with your partner, be an amazing partner. If you want people to be thoughtful and kind, be thoughtful and kind. If you want people to listen to you, listen to them. The best way to achieve success is to deserve success. Small changes in your actions change your entire world.

People tend to receive what they offer to the world. Thus, to change our world, we must change what we offer to others.

Reciprocity teaches us to be mindful of how our actions tend to come back on us. It's important to remember that we are part of the world, and thus our actions do not happen in isolation, but are instead part of an interconnected web of effects.

Physics

Thermodynamics



Reduce chaos and find order.

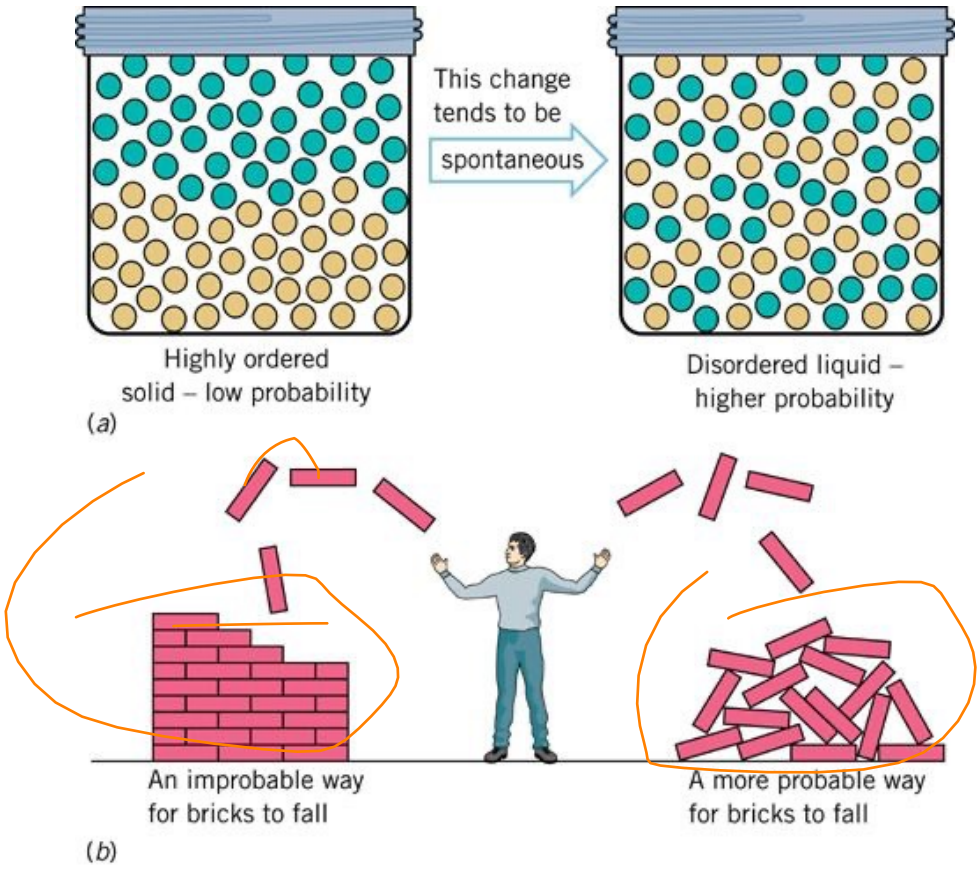
Thermodynamics

Thermodynamics refers to a set of laws that provide the ultimate foundation in how the world really works. It helps us understand randomness and disorder in systems and explains the conversion of energy from one form to another, the direction in which heat will flow, and the availability of energy to do work. One of the most useful aspects of thermodynamics is that it applies to all systems everywhere in the known universe, giving it a broad applicability. All work requires energy, and all systems are headed toward equilibrium.

In order to explore where using the model of thermodynamics might give us new insights, we need to explain the four laws that comprise the theory. Here they are:

1. The first law of thermodynamics states that energy cannot be created or destroyed; it can only be transferred or changed from one form to another, such as from light to heat. The first law is known as the law of conservation of energy and it deals with the transfer of energy. There are two forms of energy exchange—heat and work. Heat is energy exchange through thermal interaction and work is energy exchange by any process other than heat. Whereas work can be completely converted into heat, heat cannot be completely converted to work.

2. The second law of thermodynamics states that entropy (a measure of disorder simply understood as energy unable to be used to do work) of an isolated system always increases.


This change
tends to be
spontaneous
Highly ordered
solid – low probability
Disordered liquid –
higher probability
(a)
An improbable way
for bricks to fall
A more probable way
for bricks to fall
(b)

Isolated systems are those that spontaneously progress toward the state of maximum entropy of the system, also described as thermal equilibrium—no net heat flow between objects. The entropy of the universe only increases with time. One of the impacts of this law is that we need to expend energy to create order. Without the deployment of energy, all things move away from order.

3. The third law of thermodynamics states that as temperature approaches absolute zero, the entropy of a given system approaches a constant value.

4. The fourth law of thermodynamics is known as the zeroth law. This is because it was formulated after the first three laws but is fundamental to and assumed by the others. It states that if two objects are in thermal equilibrium with a third object, then those two objects are also in thermal equilibrium with each other.

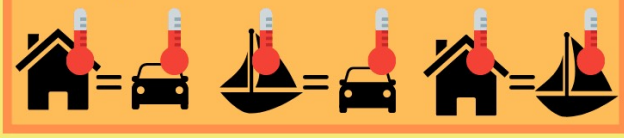
Aside from powering most of the world, the laws of thermodynamics have many metaphorical applications. One is that contrast is valuable in achieving success, like being a big fish in a small pond. We can focus on demonstrating our value in relation to those around us. We can also recognize that we will be influenced by the behavior of the people around us, and therefore, that is why it's so important to be wise in choosing who they are. Entropy reminds us that energy is required to maintain order. You need to anticipate things falling apart and focus on prevention.

Laws of Thermodynamics

Zeroeth law

Temperature

Two systems in equilibrium with a third system are in thermal equilibrium with each other.



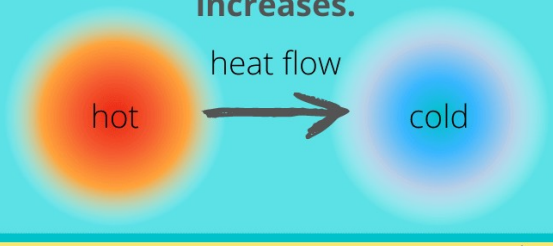
First law

Conservation of Energy

Energy can change forms, but is neither created nor destroyed.

Second law

Entropy of an isolated system always increases.



Third law

Entropy of a system approaches a constant as temperature approaches absolute zero.

« The energy state of an economy—that is, its temperature—largely determines what its members can do and how fast they can do it. Temperature—the average kinetic energy of the moving molecules in a gas—affects every chemical process and every physical property associated with life. It influences not only the cost of doing business, but the speed at which tasks can be accomplished, and perhaps most importantly the range of adaptive options available. Temperature is, in other words the crucial link between energy and time; the two components of power.»

Geerat Vermeij [1]

Putting up walls

Much of thermodynamics is about equilibrium, including the fact that two systems of different temperatures, when exposed to each other, eventually become the same temperature.

If thermal equilibrium is desirable, we can expend our efforts to maximize the exposure of the two systems to each other. Conversely, in order to keep them from reaching a state of equilibrium, some sort of insulating barrier is required. Similar to the experience of using a thermos to keep coffee hot, insulators can slow down the temperature change but cannot stop it completely.

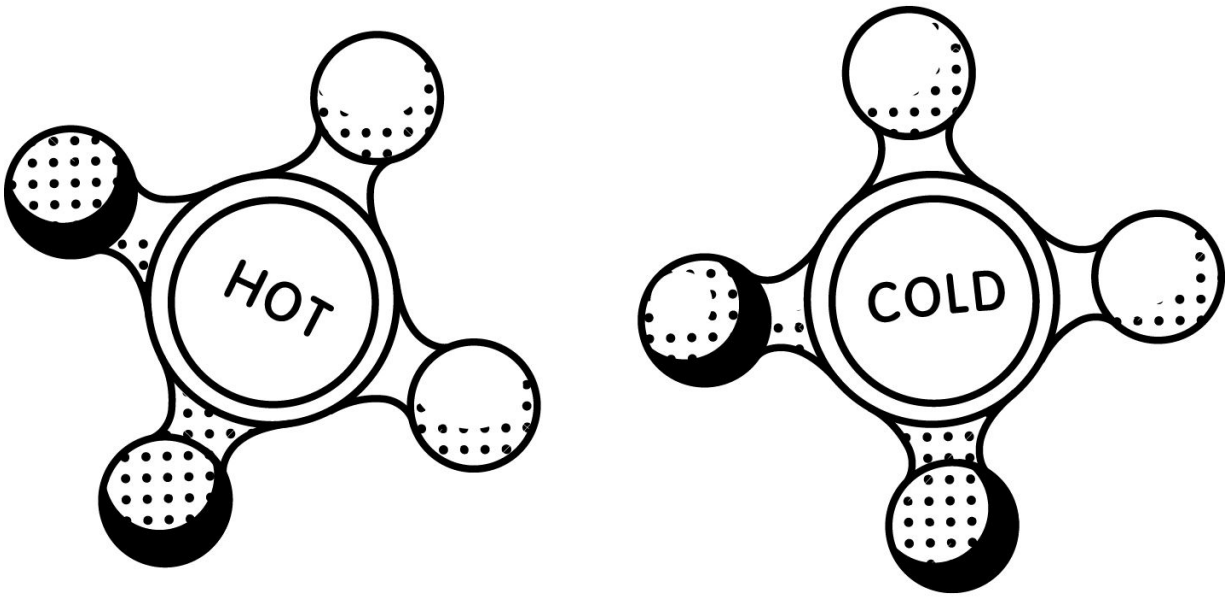
« The physical world, all of it, only ever has one destination: equilibrium. »

Helen Czerski [2]

What if we consider the equilibrium of two systems not between two containers of different temperature water, but two societies with different values.

If we want to encourage equilibrium, then we can think of sharing as transfer of energy. There are three physical modes through which to transfer energy: radiation, convection and conduction. There are clear analogies of how these modes are used socially to achieve equilibrium across boundaries. For example, radio and TV radiate ideas across borders. Teacher-student exchanges act as intellectual and social convection currents. Brands and foreign aid conduct values. Mixing cultures gives them

common ground. We move toward social equilibrium when we share ideas and values that have the same foundations.



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Much of thermodynamics is about equilibrium; including the fact that two systems of different temperatures, when exposed to each other, eventually become the same temperature.

Sometimes, however, for various political or cultural reasons we decide we don't want social or cultural equilibrium and so choose to erect an insulator in the hopes of keeping the two systems from mixing. Humans have been putting up border walls for millennia. They often serve a physical and psychological purpose, and are a line demarcating some sort of contrast. Us and them. My land, your land. Our values, your values. Our resources, your resources. These walls, however, never seem to work. From Hadrian's * Wall to the Great Wall of China to the Berlin Wall, these

complex, expensive structures stopped the movement of neither people nor ideas. Why? Because contrast is hard to maintain. It is hard to keep groups of people from sharing ideas, customs, or language, just as it is difficult and expensive to keep a cube of ice solid on a hot summer day. Through social structures such as trade or marriage, borders tend to be places of exchange and social evolution. Two different states, whether of matter or people, will be impacted by what they are exposed to. An ice cube will undergo a temperature change if left outside in warmer air, and similarly a group of people will undergo changes in custom based on who they interact with outside their group.

> « Division shapes politics at every level—the personal, local, national and international. Every story has two sides, and so does every wall. It's essential to be aware of what has divided us and what continues to do so, in order to understand what's going on the world today. »
>
> **Tim Marshall** [3]

The Romans, building Hadrian's Wall from coast to coast in northern England, seemed to best appreciate the limits of what a wall could achieve. From the outset, "Hadrian's Wall was not designed to withstand attack by a large and determined hostile army, for it was

too long for the defenders to be strong at every point."[4] Rather, the wall functioned much like a border wall today. Its design was more about controlling the movement of people and goods versus stopping it completely. From the outset, it was accompanied by a diplomatic presence, with the Roman army regularly crossing its line to engage with local tribes, building relationships to gather intelligence and to try to deter major attacks.[5]

The Romans knew Hadrian's Wall would not stop a strong enemy force, and thus the placement and design was about slowing down aggression or giving the Romans the opportunity to be proactive by developing relationships with those on the other side. Trade continued, information and materials were shared, and personal relationships were maintained by those living on both sides.[6] Hadrian's Wall thus was just one part of the overall strategy to maintain contrast between Roman territory and the tribes of the north. Controlling the interaction between both sides of the wall, instead of trying to stop it completely, was enough for the Romans, probably because they realized that there is a significant cost to improved insulation. Border walls do not do their jobs on their own; they need to be augmented by border personnel. As Adrian Goldsworthy writes of *Hadrian's Wall*, "Ultimately, its success rested less on the fortifications and barriers than on the soldiers who manned them."[7] This statement is true of all walls.

With Hadrian's Wall, the Romans did not try to prevent cultural equilibrium completely. They recognized that the resources required to prevent any interaction across the border were more than they were willing to invest. They seemed to accept that their society could function as desired despite the influence from the

cultures on the other side. To relate to thermodynamics, if we think of Roman culture as "hot," Hadrian's Wall acted as an insulator; it slowed down the cooling from exposure to other cultures but did not stop it completely.

> « But a boundary line, as any military expert will tell you, is also a potential battle line, for a boundary line marks off the territory of two opposed and potentially warring camps. »
>
> **Ken Wilber**[8]

Another famous wall that teaches us a lot about social equilibrium is the Great Wall of China. Walls have been going up between present day China and Mongolia for at least 2,000 years. Far from the restored stone wall that captures imagination today, there are actually many walls built of different materials, executed by many different dynasties along this northern border.

The history of these Chinese walls is a lesson in why barriers designed to completely prevent the mingling of two sides are a bad idea. It's similar to trying to completely prevent two substances in direct contact from reaching thermal equilibrium—the barrier required requires too many resources to be practical.

First, walls are expensive. There is the maintenance, as well as provisioning for the people stationed at them. Second, people can go around or over walls, because walls have to end somewhere. The Chinese walls were an expression of political desire to set the location of the northern border, and as Julia Lovell explains in *The*

Great Wall, they were not purely defensive structures.[9] Instead they often pushed into foreign territory as a way of asserting claim. So, these walls were often not close to major centers and they covered vast territory. Not only did they have to be staffed, they required that outposts and associated supply lines be maintained in order to provision them.

Right from the beginning there are stories about the essentially slave labor that was used to build the Chinese border walls and the horrible living conditions for those who staffed them. What good are walls without the loyalty of the troops stationed at them? Not much. The Great Wall was quite porous because "invaders could make detours around strong defenses until they found weaknesses and gaps," and it was often staffed by guards who made a better living accepting bribes from those wanting to cross.[10]

Lovell describes the Ming dynasty attitude toward the Great Wall as "define, enclose and exclude"[11] which sums up the entire philosophy behind the Chinese border walls right from the beginning. On the one hand was the desire to keep the barbarians out. The nomads from the steppes of present-day Mongolia, the most famous of which was Genghis Khan, were a constant threat to the Chinese people. But there was also a desire to keep Chinese culture in; to not pollute it with the ideas and sensibilities of others. The walls were thus also inward-looking, a way of maintaining "cultural superiority."

However, as Lovell describes, "it was not the case that border walls absolutely and immovably separated a culture of rice, silk and poetry on the one side from a culture of horse milk, pelts and war on

the other."[12] There was a lot of intermingling. There were ethnic Chinese. They were invaded by barbarians. The barbarians adopted some Chinese ways. They became the new ethnic Chinese, who were, in turn, invaded by barbarians. This cycle played out multiple times over the centuries, influencing the development of Chinese culture. The more cultures mix, the more likely they are to reach cultural equilibrium; we tend not to regard as different people we share customs with.

Lovell tells the following story, which demonstrates the natural push for equilibrium and how hard it is to maintain contrast between two cultures who are in direct contact:

> In 307 BC—in the middle of the Warring States period—King Wuling of the northern state of Zhao started a court debate about fashion: should upper garments be buttoned to the left or down the middle? Behind this seemingly frivolous and innocuous question of style lay a strategic issue of huge political and cultural significance. King Wuling planned to swap the traditional Chinese gown for the side-buttoning tunic of the nomads, and the aristocratic Chinese chariot for their mounted archers. Embedded in the mooted change of dress was a revolution in worldview: an acceptance of the military superiority of the nomads and of the need to fight them on their own terms.[13]

Thus the history of China is not the story of a culture that managed to completely insulate itself and remain "pure." Current

Chinese culture is composed of influences and ideas that were exchanged along its borders.

Of all the walls in history, the Berlin Wall stands out as one that was erected to be an absolute, uncompromising barrier that was intended to prevent the mixing of two ideologies; to stop equilibrium. Walls don't just restrict physical movement: they can shape and modify ideas and social norms.

The Berlin Wall was different from Hadrian's Wall and the Great Wall of China in that it was less part of a military and diplomatic strategy and more a psychological barrier. It was not designed to facilitate interaction with potentially hostile tribes (like Hadrian's) or to claim territory and preserve culture (like China's).

The Berlin Wall tried to stop the movement of ideas as well as people. Soviet Communism and its East German counterpart depended on behavior-shaping propaganda and psychological controls, neither of which would work if challenged by outside economic or political ideas.

The Berlin Wall was built to stop every possible transfer from one side to another. After World War II, when Germany was divided into East and West, Berlin became this little oasis of democracy behind the Iron Curtain of Communism. It was the only weak point in an otherwise formidable barrier between the ideas and politics of the Americans and the Soviets.

Berlin was occupied by Britain, the United States, France, and Russia after the war. Until 1961 it still functioned as one city, which allowed for an escape route for those who wanted to leave communist East Germany. As Frederick Taylor explains, explains in *The Berlin Wall*,

> Between 1945 and 1961, some two and a half million fled in this way, reducing [East Germany's] population by around 15 per cent. Ominously for the Communist regime, most emigrants were young and well qualified. The country was losing the cream of its educated professionals and skilled workers at a rate that risked making the Communist state totally unviable.
>
> During the summer of 1961, the exodus reached crucial levels. Every day, thousands of East Germans slipped into West Berlin and from there were flown to West Germany itself along the so-called "air corridors." The regime was not prepared to abandon the political and economic restrictions that fueled the hemorrhaging of its brightest and best. [14]

So they built a wall. And not just any wall—one with multiple layers of complexity and deterrents. In addition to the structure above ground, subway tunnels, sewers, and anything that could give passage to the west was sealed off or modified so that human passage was thwarted.

The Berlin Wall never worked completely. People still crossed, albeit at huge risk, and some lost their lives in the attempt. But what is even more remarkable is that the Berlin Wall contributed to the very ideology it was trying to keep out. Effectively keeping the population prisoner only served to undermine the values of communism East Germany was trying to promote. The pressure built until one day, in November 1989, it was taken down by the very people it had been trying to keep apart.

The story of the Berlin Wall is a clear example the inevitable force toward equilibrium. There was no way for the East German state to invest enough energy to prevent the social heat exchange and eventual equilibrium.

To keep two substances in direct contact from adjusting to the same temperature is difficult. It requires an insulator and preventing any temperature change in the two substances is only possible with a constant investment of energy. The concept of equilibrium is a useful lens to understanding the inevitable fall of physical walls that humans have built around the globe. It is difficult to prevent two cultures in direct contact from sharing ideas and customs.

—Sidebar: The problem of equilibrium.

We don't Like disorder

As we have seen, maintaining order requires energy. Why put in that energy? Why extended ourselves to avoid the inevitable disorder of life? Using the second law of thermodynamics as a lens provides valuable insight into why reducing entropy is important. Entropy can come across as too complicated or nonsensical, so some effort in coming up with an easy to use definition is well worth it.

Murray Gell-Mann, a Nobel prize winning physicist, clarifies entropy in contexts such as organizing a pile of coins or the mixing of jelly and peanut butter in their containers. Why is it that if someone knocks the table the coins will get mixed up, or that despite their best efforts your children inevitably get jelly into the peanut butter jar and vice versa? "The explanation is that there are more ways for [coins] to be mixed up than sorted. There are more ways for peanut butter and jelly to contaminate each other's containers than to remain completely pure. To the extent that chance is operating, it is likely that a closed system that has some order will move toward disorder, which offers so many more possibilities." [15]

The Value of Contrast

The problem of equilibrium. Writing in *Twilight of the Idols*, Friedrich Nietzsche says of politics, "Almost every party grasps that it is in the interest of its own self-preservation that the opposing party should not decay in strength."[1] This is pointing out that there is value in contrast. If all the forces are balanced, a true state of equilibrium, there is no change, no growth, no movement. It is contrast that drives development.

A simple example of entropy is to consider life itself. There is a constant effort to maintain structure (avoid entropy) by consuming external energy (sunlight, food). In the process, life increases the entropy of (destroys) its environment and decreases entropy (builds or repairs) the organism's body.

Another way to think of entropy is to imagine the game of broken telephone that you might have played when you were younger. A group of children are sitting around in a circle, and one child starts the game by whispering a sentence into the ear of the person next to them. The sentence gets transferred one child at a time until it has made its way around the circle. The final sentence is compared to the original, often with much hilarity. Something mundane like "today is Wednesday" can turn into "I like scary movies." Because there are so many more options for change to occur, each repetition is more likely to drift from the original.

[A living organism]... feeds upon negative entropy... Thus the device by which an organism maintains itself stationary at a fairly high level of orderliness (= fairly low level of entropy) really consists in continually sucking orderliness from its environment.

— Erwin Schrodinger —

AZ QUOTES

« Art is born out of as well as encapsulates the continuing battle between order and chaos. It seeks order or form, even when portraying anarchy »

John Yorke [16]

Humans put a lot of effort into preventing disorder. If we look at society broadly, we notice that disorder flares up all the time. The structures we create nudge the natural disorder of life into order. Examples of this are laws, religions, social norms, customs, and the stories that explain and perpetuate them.

While the stories we tell are unimaginably diverse on the surface, if we go deeper we can spot distinct patterns and structures that emerge every single time. The content may vary, but the form of the stories we tell is remarkably predictable. Fairy tales are one way we have combated disorder in our history. They offer explanations for occurrences that seem to have none, giving a structure to what we find hard to comprehend. Fairy tales also set out a common understanding that everyone can buy into, trying to slow down entropy by preemptively fitting the unexplainable into a systematic order.

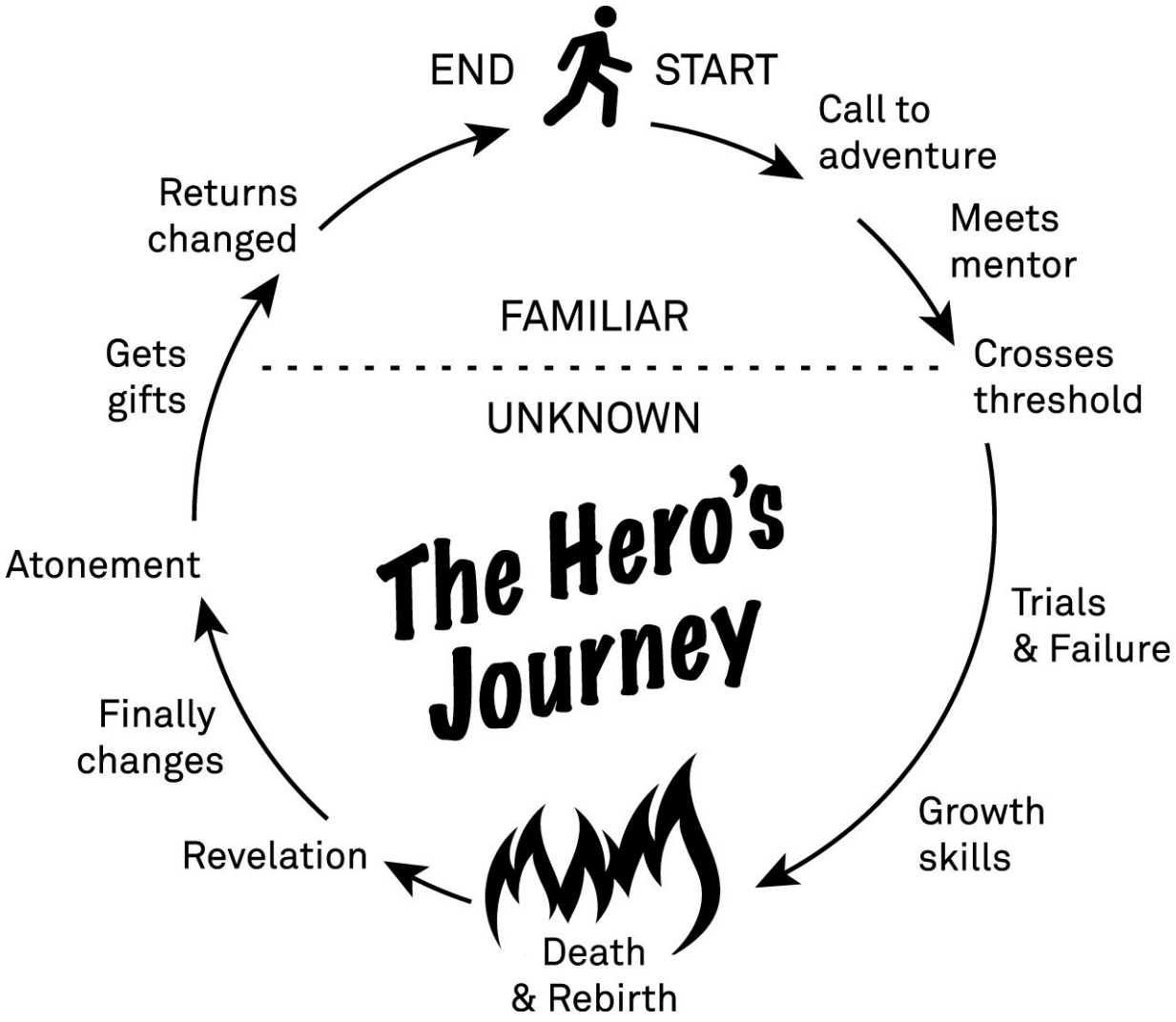
The patterns in our fairy tales are so inescapable across time and cultures that it seems logical to suggest there must be a reason. Soap operas may not seem to have much in common with Shakespeare, yet at the heart of every story is the drumroll moment —the turning point when everything changes, and the characters

must go on a journey to restore normality. As if we can slow down entropy by telling stories to reduce disorder.

Fairy tales these days are often associated with the Disney renditions most of us are familiar with. But the original compilations, such as those collected by the Grimm brothers, or the more original versions pulling from even older stories, like those by Hans Christian Andersen*, offer a better view to show how fairy tales can be understood as combating entropy.

In *Into The Woods,* John Yorke suggests that the way we tell stories is indicative of our desire to find order in the world. Stories are an attempt to tame the terrifying randomness that surrounds us. As we go through life, we are constantly absorbing chaotic information that we make sense of through narratives. Yorke writes that "every act of perception is an attempt to impose order, to make sense of a chaotic universe. Storytelling, at one level, is a manifestation of this process."[17]

The core structure of the stories we tell can be described in a few different ways; equilibrium—disequilibrium—new equilibrium, journey there / journey back, someone is looking for something and someone or something is in their way, and so on. In more detailed terms, Yorke describes the archetypal story structure as follows:


END
START
Call to adventure
Meets mentor
Crosses threshold
Trials & Failure
Growth skills
Death & Rebirth
Revelation
Finally changes
Atonement
Gets gifts
Returns changed
FAMILIAR
UNKNOWN
The Hero's Journey

The Hero's Journey

- 'Home' is threatened
- The protagonist suffers from some kind of flaw or problem
- The protagonist goes on a journey to find a cure or the key to the problem
- Exactly halfway through they find a cure or the key
- On the journey back they're forced to face up to the consequences of taking it
- They face some kind of literal or metaphorical death
- They're reborn as a new person, in full possession of the cure; in the process 'home' is saved.

Fairy tales beat back the stress that disorder can cause by putting the world back in order. As Marina Warner argues in *Once Upon a Time: A Short History of Fairy Tale*, they convey a hope that order can come about even in the face of almost unexplainable acts.[18] Child abandonment and neglect, rape and death, fairy tales take away the randomness by putting these acts into a larger, explainable structure and offering insight on how to process them.

We are drawn to stories that make things feel a little less random, just as we are drawn to storytellers who seemingly simplify complexity. We are all aware of disorder and the natural uncertainty that follows it and are attracted to stories that reduce it.

By turning individual struggles into common experience, fairy tales put order into the disorder of "assault, cruelty, and injustice."[19] These stories do not feature gods or superheroes, and instead look at the everyday person as they navigate their ordinary

lives. "The structures of wonder and magic open ways of recording experience while imagining a time when suffering will be over." [20] Namely, when disorder will be conquered.

There are no surprises in fairy tales. Not for the characters and not for us. We have heard the story before and know what will happen. However magical the world they depict, we have total faith in the structure of the story. That predictability is one means of providing order to things that would otherwise seem chaotic. What you learn about the world through fairy tales is to accept things that may not make obvious sense. Trust that there is order behind them, and by doing so slow down the entropy of life.

"The landscape of fairy tales is symbolic: 'the forest is where you are when your surroundings are not mastered'." [21] Fairy tales provide a means of mastering your surroundings by presenting a way to understand your world, giving it some order and helping you make your way through it.

While works that deviate from the archetypal narrative can be interesting, those that follow it most closely tend to enjoy the most commercial success. They just *feel* right. They are an escape from the chaotic real world. Unable to face meaninglessness, "in order to stay sane we must impose some kind of pattern." [22] This is what narratives achieve, and it's the same reason we craft them within our own lives. They give us a sense of a coherent identity.

It is interesting that fairy tales cross cultural and geographical boundaries. Similar stories occur in many places. Sometimes this is due to exchange via travel. The stories carried by wanderers were then modified and built on in their new homes easily because their structure had already occurred. Often, though,

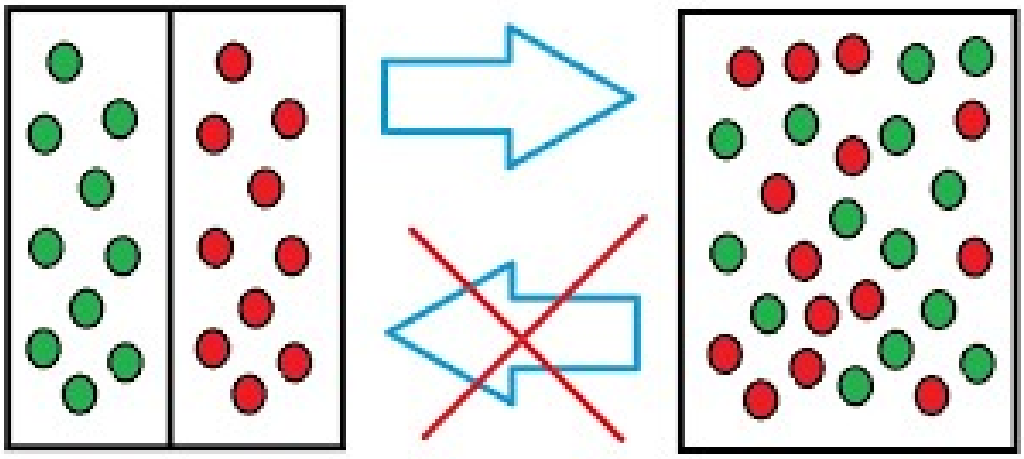
fairy tales in different cultures are very similar even when it's not believed they were shared through travel. They are a common cultural phenomenon. So it is understandable that they have a lasting, worldwide appeal. The staying power of fairy tales "suggests that they must be addressing issues that have a significant social function."[23] By informing behavior in a similar way, fairy tales combat entropy by creating a common understanding that most people can interact with.

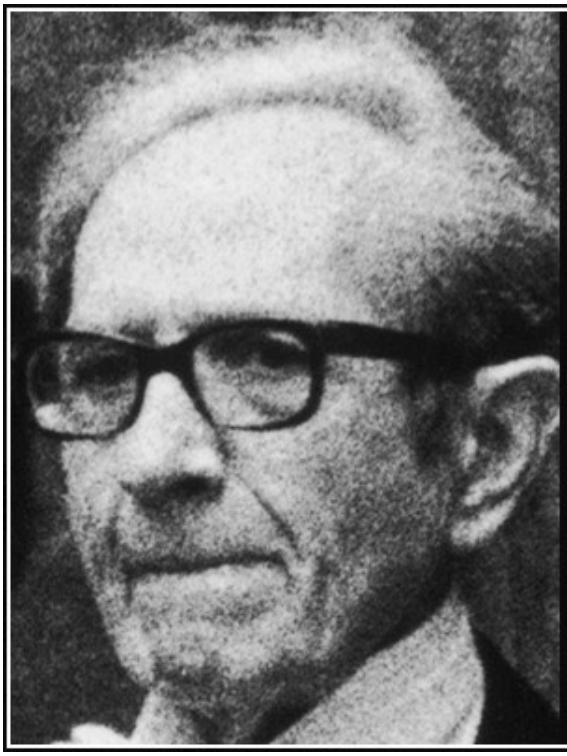
Between the Grimm Brothers and Pixar, the role of fairy tales has been explored and revisited through lenses that change as society evolves. They are not necessarily the things they once were in terms of their role in social norms. But just because they've changed doesn't mean that humans have ceased to use stories to beat back disorder. Entropy is a law of thermodynamics, arguably the one we struggle with understanding the most. But our awareness of the higher potential for disorder is evident through our use of fairy tales to create order out of disorder.

Conclusion

Nothing escapes the laws of thermodynamics. Everything is moving toward equilibrium, including people, culture, ideas, and information. Of course, total equilibrium means no life, so the place where there is no difference in anything is the place where everything rests. Thus, while pursuing difference is worthwhile and necessary, it's important to understand that any barrier you try to erect will face a relentless pressure to attain equilibrium. Therefore, it's important to remember that it takes a lot of work to maintain separation.

Entropy is a similar constant. The end state of high entropy is also incompatible with life. Sensing this, we try to understand randomness and the unexplainable through stories that seem to put order back into our lives, thereby reducing entropy. Narratives are important. We use them to reduce chaos and stop us drifting too far from social order and cultural norms, which allows us to maintain our complex societies.





Life, this anti-entropy, ceaselessly reloaded with energy, is a climbing force, toward order amidst chaos, toward light, among the darkness of the indefinite, toward the mystic dream of Love, between the fire which devours itself and the silence of the Cold.

— Albert Claude —

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