

#12. A Summary of 'Imagine: How Creativity Works' by Jonah Lehrer

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'Imagine: How Creativity Works' by
Jonah Lehrer (Houghton Mifflin
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i. Introduction/Synopsis

When we are lucky enough to be stricken with a particularly imaginative thought or creative idea, it often feels as though it is coming from outside of us—as though we are but the vehicle for its transmission. As a reflection of this, in the past artistic creativity was thought of as a force that was sent down from above, a gift from the gods that the artist was required to wait patiently for; the artist being but a vessel through which the force could act. The moment of epiphany is so sudden, so seemingly without precedent or cause, that it may seem to defy logical explanation, and hence to be outside of the bounds of scientific study. However, according to journalist and author Jonah Lehrer, science is beginning to understand how creativity works, and how it can be fostered, and it is this understanding that he brings to the table in his new book 'Imagine: How Creativity Works'.

By taking us on a tour of very creative individuals, organizations, cities and cultures—and drawing on the latest in neuroscience and social psychology—Lehrer hopes to help us understand the stuff of creativity, and to help us cultivate it in our ourselves, and the organizations, cities, and cultures of which we are a part. The book itself is split into two parts, with the first part focusing in on creativity in individuals, and the second part

concentrating on creativity in groups.

When it comes to creativity in individuals, we learn that imaginative epiphanies originate in the right hemisphere of the brain—whose role it is to pull together disparate and seemingly unrelated ideas. What's more, we learn that creativity is associated with a particular kind of brain wave (called an alpha wave), and that these brain waves are often best encouraged by way of turning away from the problem that we are trying to solve, and simply relaxing and distracting ourselves in order to allow them to emerge on their own.

Creative ideas rarely come in finished form, however, and therefore, perfecting these ideas requires deep persistence and hard work. The attention to detail and focus that this process requires can be aided by certain substances and states of mind that are not always healthy (such as narcotics and depression), but it cannot be avoided; genius requires hard work. Nothing good is easy.

At times, and indeed more and more nowadays, difficult problems require the creative efforts of more than just one person: they require a collective effort. However, getting groups to be creative is not an easy task, as it requires the right mix of people, and the right approach. For instance, the most creative and productive groups tend to be those where the members are mostly well-acquainted with one another, and have worked together before, but who are also joined by a healthy measure of new and unfamiliar talent. In addition, the best approach for groups to have seems to be one where the members practice a kind of constructive criticism, and collective responsibility.

Beyond certain groups being more creative than others, even some cities have an edge over others when it comes to creativity, and here again there are some essential features that separate the more creative from the less-so. According to Lehrer, the key to creative cities is density, diversity and maximizing interactions, and there are ways that we can (and should) design and organize our cities that optimizes all of these.

Finally, we learn that even some cultures are more creative than others, as is evidenced in particular by the fact that geniuses tend to cluster in certain times and places, such as ancient Athens circa 400 BC, Florence, Italy circa 1500 AD, and Shakespeare's London of the 16th century. Once again, there are certain factors that make some cultures more creative than others, and Lehrer argues that our institutions and laws can be designed in such a way that encourages this creativity. In particular, we must follow a specific approach to education and immigration, encourage risk-taking, and we must also find the right balance between protecting intellectual property rights, and allowing established ideas to be borrowed for the purposes of new innovations.

*To check out this book at Amazon.com, or purchase it, please click here: [Imagine: How Creativity Works](#)

What follows is a full executive summary of Jonah Lehrer's *Imagine: How Creativity Works*.

PART I: CREATIVITY ALONE

1. Epiphanies

Lehrer begins his tale of creativity with the phenomenon of the 'insight experience': the 'eureka' moment. The latter term itself comes to us from that most famous of epiphany stories: Legend has it that the ancient Greek scientist Archimedes came up with his method of measuring the volume of an object (through buoyancy) upon stepping into his bathtub—a discovery that so surprised and thrilled him that he immediately set about running through the streets (not bothering to clothe himself beforehand) yelling 'eureka' (literally 'I have found it') at the top of his lungs (loc. 283). A similar, and equally famous (though somewhat less dramatic) epiphany story is that of Isaac Newton coming up with his theory of gravity in 1666. Newton, the story goes, was passing beneath an apple tree (or sitting under it, in some versions of the story), when an apple fell from above, striking him on the head. All at once Newton had his stroke of insight, and the world of science was never to be the same again.

Though these stories may be embellished to a degree, they do embody several common themes when it comes to the moment of epiphany. To begin with, the 'insight experience' seems to be one that comes out of nowhere, and arrives when we least expect it (loc. 265). Second, an epiphany doesn't come bit by bit or piecemeal, but rather all at once, such that it is "shocking in its completeness" (loc. 265). Also, after the insight has hit us, it seems so incredibly obvious that, as Lehrer puts it, "we curse ourselves for not seeing it sooner" (loc. 265).

These are the elements of the epiphany that we are most likely to tell others upon our relating the experience. However, there is one other feature of the 'eureka' moment that we tend to leave out of the story, but which, for Lehrer, is key to understanding the phenomenon. And this is the fact that an epiphany tends to come only after a prolonged mental block. A mental block that may well have had us at the brink of despair: "the act of being stumped... is an essential part of the creative process. Before we can find the answer... we must be immersed in disappointment, convinced that a solution is beyond our reach. We need to have wrestled and lost... it's often only at this point, after we've stopped searching for the answer, that the answer arrives (The imagination has a wicked sense of irony)" (loc. 265). As a testament to this, while Archimedes' and Newton's epiphanies are well known to all of us, what is less well known is that both of these men struggled with their respective problems for months, if not years, before they stumbled upon their solutions.

The question becomes, then, how does this reversal of fortune occur: “What allows someone to transform a mental block into a breakthrough? And why does the answer appear when it’s least expected?” (loc. 276). For Lehrer, in order to answer this question we will need to look inside the brain, which, with the advent of sophisticated brain scanning technology in the past 20 years (including the PET scan, EEG and the fMRI), we are now able to do.

2. Epiphanies in the Brain

(and the Role of Frustration and Relaxation in Creativity)

Of course, just because we are now able to look inside the brain as it operates, does not mean it will necessarily be easy to monitor the brain in the act of having an insight, for as we know, these moments of insight are not all that easy to come by. As it turns out, though, there are puzzles that can be devised that require a leap of insight on the part of the brain (loc. 383). Given that this is the case, it is simply a matter of monitoring the brain as it solves these ‘insight problems’.

In order to truly capture the nature of insight though, the neuroscientist Mark Beeman wanted not just to observe the brain as it was solving an insight problem, but to compare this with how the brain solves the same problem in the more traditional manner of conscious analysis (loc. 375-79). In order to do this, Beeman needed to come up with some puzzles that could be solved either by insight or by conscious analysis, and this proved to be a very difficult challenge indeed (loc. 379-90). Nevertheless, Beeman was able to design a number of verbal puzzles that fit the bill. He called these puzzles Compound Remote Associate Problems, or, you guessed it, CRAP: “The joke is beginning to get old. ‘Yes, yes, I’m studying CRAP,’ Beeman grumbles” (loc. 391). Here is an example of a CRAP: “a subject is given three different words such as *age*, *mile* and *sand*, and asked to think of a single world that can form a compound or phrase with each of the three” (loc. 395). The puzzle can be solved through analysis by way of forming a compound word involving one of the clue words, and then testing out on the new word with the other clue words (loc. 400). However, the problem can also be solved through a flash of insight (loc. 400). (Spoiler alert: one solution to this problem is ‘stone’: ‘stone-age’, ‘milestone’, ‘sandstone’).

After generating numerous CRAPs, Beeman brought his subjects into the lab and hooked them up to the brain scanners for testing. The experimental process followed a similar pattern in each case in that the subjects would start out trying to solve the puzzles through conscious analysis. If they were able to solve the puzzle in this way, then great, they would move on to the next one. But if they weren’t able to solve the puzzle they would soon get frustrated; many even “complained to the scientists about the difficulty of the problems and

threatened to quit the experiment” (loc. 425). At this point, though, something interesting happened. Just when the subjects had given up on any given problem, many of them would have that ‘aha’ moment, and the answer would just come to them: “‘You’ll see people bolt up in their chair and their eyes go all wide,’ says Ezra Wegbreit, a graduate student in the Beeman lab who often administers the CRA[P] test. ‘Sometimes, they even say “Aha!” before they blurt out the answer” (loc. 429).

So, what was going on in the subjects’ brains while all of this was happening? In the first place, when the subjects were trying to answer the puzzles by way of conscious analysis there was a rash of activity in the left hemisphere of their brains. This is not surprising given that the left side of the brain is home to our capacity for both logic and language (loc. 416). If this strategy failed, though, the activity in the subjects’ brains moved to their right hemisphere (loc. 423-26, 443-47). Should the subjects have stumbled upon that moment of insight, it is here that it emanated from (loc. 435, 447). In fact, Beeman and his team were able to pinpoint the precise location from which an insight emanates down to a very small structure in the right temporal lobe called the anterior superior temporal gyrus (aSTG) (loc. 435).

That the right side of the brain has a key role to play in insight was not necessarily a big shock to Beeman. This proves to be the case because he was already aware that while the left side of the brain is excellent at analyzing distinct elements of things (loc. 330), and is also very literal-minded in its thinking (loc. 312, 321, 423), the right side of the brain is adept at making sense of the whole, and is also proficient at finding the subtle connections between distant and seemingly unrelated things (loc. 308). For instance, it is the right side of the brain that is responsible for making sense of maps as well as whole pictures (loc. 299, 330-34). And it is also the right side of the brain that is responsible for understanding such things as metaphors, jokes and sarcasm (loc. 299), all of which require non-literal, lateral thinking (loc. 312-26). Likewise, if you are trying to solve a problem and are given a hint as to its solution, it is the right side of the brain that interprets the hint (loc. 351-56).

Now, as Beeman points out, insights “require the brain to make a set of distant and original connections” (loc. 439), and therefore, it makes perfect sense that it would be the right side of the brain that would be responsible for these insights. Interestingly, it is only once the literal and conscious analysis of the left side of the brain has failed that the brain switches its strategy to the less literal and more far reaching strategy of the right side (loc. 422-26). With this in mind we can begin to understand why insights often require our having already given up on a problem, and having come to the pits of despair: the frustration is needed for the brain to give up on the literal and conscious approach of its left side, and switch to the more holistic and wide-ranging approach of its right side—which is needed in order to produce the insight that we require.

Thankfully, though, driving the brain to frustration is not the only way that we can coax an insight from ourselves. Indeed, it seems all that is needed is for us to distract ourselves

from the problem long enough to allow the subconscious to step in and take over (loc. 624-29). By distracting ourselves from the problem, we cut off the left brain's efforts to solve the problem through its literal and conscious approach, and allow the right brain to unconsciously explore the mixture of disparate ideas that may allow for an insight to strike (loc. 650-58). Now, there are a number of ways to go about this; anything from sleeping (or daydreaming) on a problem (loc. 645, 830-43), to relaxing by way of meditating (loc. 698-702), going for a walk (loc. 911), playing a game (loc. 911) or having a nice warm shower or bath (loc. 615). In the end, it may not be such a coincidence that Newton had his insight while strolling through his garden, or that Archimedes was in his bathtub when he made his.

Here is Jonah Lehrer on the insight experience:

3. The Outsider Effect

Interestingly, the fact that the brain is often able to solve a problem by way of pulling together disparate and seemingly unrelated ideas helps us understand another phenomenon in creative thinking, and that is the outsider effect. The outsider effect has to do with the fact that creative solutions to problems are often had by people who are either very new to, or even outside of the field in which they make their discoveries. For instance, the web site [InnoCentive](#) is a crowd sourcing site where corporations can go and post their innovation challenges and problems to the public. In order to entice the public to contribute their solutions, the corporations offer up monetary rewards to anyone who can successfully solve one of their challenges. The website has been remarkably successful. For instance, the Harvard business professor Karim Lakhani has studied the site and found that “nearly 40 percent of the difficult problems posted on InnoCentive were solved within six months. Sometimes the problems were solved within days of being posted online” (loc. 1915). Interestingly, though—and of particular significance for our purposes here—is that in a large percentage of the cases the challenges were solved by people whose expertise was outside of the field from which the problem came. For instance, “chemists didn’t solve chemistry problems, they solved molecular biology problems, just as molecular biologists solved chemistry problems” (loc. 1923). As Lakhani himself explains, “Our results showed that when the solvers rated the problem as outside their own field, they were more likely to discover an answer” (loc. 1923).

Here is a promotional video from InnoCentive explaining how their operation works:
[InnoCentive Promotional Video](#)

Here is InnoCentive’s channel on Youtube: [InnoCentive Channel](#)

And here is a more general video explaining how crowd sourcing works:

Here is the website that the video mentions at the end: [Crowdsourcing.org](https://www.crowdsourcing.org)

The reason why the outsider effect is so common, it is thought, is because people who are experts in a given field have a host of ideas that people in other fields do not have access to, but which ideas are nonetheless capable being applied to those fields (loc. 1927). Indeed, as Lehrer points out, “our breakthroughs often arrive when we apply old solutions to new situations” (loc. 722). In a similar vein, the author reminds us that “the history of innovation is full of inventors engaged in ‘compounding’ and ‘transposing’. Johannes Gutenberg transformed his knowledge of winepresses into an idea for a printing machine capable of mass-producing words. The Wright brothers used their knowledge of bicycle manufacturing to invent the airplane. (Their first flying craft was, in many respects, just a bicycle with wings.)... And Larry Page and Sergey Brin developed the search algorithm behind Google by applying the ranking method used for academic articles to the sprawl of the World Wide Web; a hyperlink was like a citation. In each case, the radical concept was merely a new mixture of old ideas” (loc. 747).

In addition to the fact that outsiders often have valuable knowledge and information that insiders do not have, it is also the case that insiders often fall into the conventional thinking that is associated with their particular field. Indeed, as the psychologist Dean Simonton has pointed out of many scholars, “after a few years in the academy... the ‘creators start to repeat themselves, so that it becomes more of the same-old, same-old’ They have become insiders” (loc. 1964). Conventional thinking is anathema to creativity, of course, so we can see why those who are very new to a field, or who are outright outsiders, would have an advantage in terms of creative thinking (loc. 1923, 1935). As Simonton says of newbies, “they’re innocent and ignorant, which makes them willing to embrace new ideas” (loc. 1964).

The fact that innovations are spurred on by bringing together ideas from different fields is now beginning to be exploited by several businesses and organizations. The practice itself is called horizontal sharing, and it consists simply in having the members of the different departments in one’s organization share their discoveries and conundrums with the members of every other department (loc. 707-15). For instance, the company 3M has established what it calls a Tech Forum: “an annual event at which every researcher on staff presents his or her latest research” (loc. 710). Larry Wendling, a vice president of 3M, explains that “It’s like a huge middle-school science fair... You see hundreds of posters from every conceivable field. The guys doing nanotechnology are talking to the guys making glue. I can only imagine what they find to talk about” (loc. 713). This type of forum has now been widely copied (loc. 710). For instance, Google has established a similar event that it calls CSI: Crazy Search Ideas (loc. 710). (The theme of horizontal sharing will be taken up again below in the section on creativity in businesses and organizations).

4. The Refinement Stage

a. Focus & Concentration (and Letting Go)

Now, coming up with a creative idea is one thing, but the fact of the matter is that these creative ideas, when they do come to us, rarely show up in finished form. Indeed, as Lehrer points out, “the new idea is rarely the end of the creative process. The sobering reality is that the grandest revelations often still need work. The new idea... has to be refined, the rough drafts of the right hemisphere transformed into a finished piece of work” (loc. 990).

Unlike the epiphany, which requires combining distant and seemingly unrelated ideas, the process of refinement requires intensely focussing on each particular element of the idea in turn. It requires minor and incremental tweaks and re-tweaks rather than major innovations (loc. 1073). And most of all, it requires persistence: the capacity to stick with each element of the idea for long periods of time, and to not let any of them go until each is just right: “the reality of the creative process is that it often requires persistence, the ability to stare at a problem until it makes sense. It’s forcing oneself to pay attention, to write all night and then fix those words in the morning. It’s sticking with a poem until it’s perfect; refusing to quit on a math question; working until the cut of a dress is just right. The answer won’t arrive suddenly, in a flash of insight. Instead, it will be revealed slowly, gradually emerging after great effort” (loc. 983).

As a prime example of painstaking determination, Lehrer urges us to consider the poet W.H. Auden. Auden’s poems, Lehrer argues, read as though they were written effortlessly. The author offers the following stanza as an example of this (loc. 1019):

All I have is a voice

To undo the folded lie,

The romantic lie in the brain

Of the sensual man-in-the-street

And the lie of Authority

Whose buildings grope the sky:

There is no such thing as the State

And no one exists alone;

Hunger allows no choice

To the citizen or the police;

We must love one another or die

As effortless as this writing sounds, Lehrer explains that “that ease is an illusion: Auden lavished months of attention on these lyrics, patiently fixing the flaws and cutting the excess... Auden was fully able to focus on the writing until it was lean and spare and ready for publication... relentless[ly] refin[ing] his words. He thought about the lines and then he thought some more” (loc. 1025).

Not surprisingly, our capacity to focus and concentrate intensely in order to refine our work emanates from a different part of the brain than our capacity for insight. Indeed, while the latter emanates from the right hemisphere, the former originates in the prefrontal cortex—the brain’s director and executive decision-maker (loc. 1047).

Interestingly, one of the ways that we can squeeze more creativity out of ourselves is by shutting down the mechanism that acts as a check on the flow of thoughts from the prefrontal cortex (loc. 1484). This is the same mechanism (located in the dorsolateral prefrontal cortex [DLPFC][loc. 1478]) that ensures that you don’t say or do the wrong thing in a given set of circumstances: “[it] keeps each of us from making embarrassing confessions, or grabbing at food, or stealing from a store” (loc. 1479). While the DLPFC is certainly good at this role, it can also inhibit creativity, which is why improv actors warm up with exercises that work to shut this inhibitor down (loc. 1642-50), and successful Jazz musicians are able to ‘deactivate’ it before playing an improvised piece (loc. 1479-84).

b. Amphetamines

Returning to Auden now, it turns out that the poet actually had a bit of help with his work. Indeed, Lehrer points out that Auden was a dedicated user of Benzedrine, “an amphetamine that accelerated his brain” (loc. 942). It was the amphetamines that allowed Auden to keep his intense concentration for hours on end, and month after month: “writing was exhausting for him,” Lehrer writes, “but the pills allowed him to persist, to play with his words until they were perfect” (loc. 1025). Auden himself said of the drug that “[it] is a labor-saving device... It turns me into a machine” (loc. 942). Interestingly, amphetamines allow us to focus more intently because they activate the neurotransmitter dopamine, which is itself a chemical that leads us to focus on particular objects in the environment (loc. 1030-43).

As it happens, Auden was not the only creative individual who relied heavily on amphetamines. Among writers, Lehrer includes the names of Robert Louis Stevenson, Graham Greene, James Agee, Philip K. Dick, and Jack Kerouac (loc. 950-59), and this is just the tip of the iceberg. Sadly, while amphetamines may help the creative process, they also have many negative side-effects. As Lehrer explains, “Benzedrine is extremely addictive. It’s also been known to cause insomnia, psychotic episodes, tremors, constipation, and cardiac arrest” (loc. 999). Also, while amphetamines may aid the creative process insofar as they help us concentrate and focus, they can also harm the creative process in that they inhibit insight and epiphanies: “Because the drugs sharpen the spotlight of attention, they make it

much harder for anyone to hear those remote associations emanating from the right hemisphere. The distracting murmurs of the mind are silenced; the alpha waves disappear” (loc. 999).

c. Melancholy & Depression

Now, on the bright side, amphetamines are not the only way to encourage the focus and persistence that is needed to perfect our ideas. Unfortunately, though, the next best alternative may be no better for our health. For that alternative is none other than melancholy and depression. To begin with, the connection between creativity and depression is well-established. For instance, the professor of psychiatry Kay Redfield Jamison has studied the biographies of famous English writers and poets, and concluded that “famous writers were eight times as likely as people in the general population to suffer from major depressive illness” (loc. 1314). Also, the neuroscientist Nancy Andreasen performed a study on the dozens of writers of a particular writer’s club (the Iowa Writer’s Workshop) and came up with similar results: “Andreasen found that 80 percent of the writers met the formal diagnostic criteria for some type of depression. These successful artists weren’t crazy—they were just exceedingly sad” (loc. 1310)

These findings have even been corroborated in the lab. For instance, the social psychologist Joe Forgas has repeatedly shown that sadness tends to increase creativity (loc. 1282). In one experiment, Forgas manipulated the moods of his subjects by showing them either a film clip about cancer and death, or a neutral film clip. He then had his subjects compose writing samples. What Forgas found is that his saddened subjects composed considerably better writing samples: “downcast... subjects compose sentences that are clearer and more compelling... they produced more refined prose, the words polished by their misery” (loc. 1295). Subjects made to feel sad have even been shown to be better collage artists (loc. 1303).

So, why is it that melancholy and depression contribute to creative output? Every last experimenter involved in the aforementioned studies and experiments agreed that it is because sadness induces us to be more attentive, and also more persistent in our work (loc. 1282, 1290, 1303, 1316-20). For instance, Modupe Akinola, the scientist behind the collage experiment, claimed of his subjects that “the sadness improved their focus and made them more likely to persist with the creative challenge. As a result, they kept on rearranging the felt, playing with the colorful designs” (loc. 1305).

Again, though, as with the case of amphetamines, it does not take much to see that melancholy and depression are not exactly healthy states of being. In addition, like amphetamines, there is evidence to believe that while depression may increase our capacity for persistence, it can also block insight (loc. 1287). Indeed, we have good evidence to the effect that insight is actually aided by positive moods rather than negative ones (loc. 630-43).

Given that insight and persistence are the two most integral features of creative output, and given that positive moods encourage the former, while negative moods encourage the latter, we can begin to understand why there is such a strong correlation between creativity and bipolar disorder, “an illness in which people oscillate between intense sadness and extreme euphoria” (loc. 1329). Indeed, the psychiatrist Hagop Akiskal has found that “nearly two-thirds of a sample of influential European artists were bipolar” (loc. 1333). In support of this, Nancy Andreasen—the same scientist who led the study on the Iowa Writers Workshop—discovered that “nearly 40 percent of the creative people she investigated had the disorder, a rate that’s approximately *twenty times* higher than it is in the general population” (loc. 1329). When speaking of the turbulent condition, Lehrer explains that “while this volatility is horribly painful, it can also enable creativity, since the exuberant ideas of the manic period are refined during the depression” (loc. 1337).

Here’s hoping we have the good fortune to come up with insightful ideas through relaxation alone, and the fortitude to refine our ideas without amphetamines or depression!

PART II: CREATIVITY TOGETHER

Section 1: Creativity in Groups and Organizations

5. The Power of Collective Creativity

Individual creativity is certainly a good starting point, but as Lehrer points out, today’s problems are becoming increasingly complex, and more and more of these problems require collective efforts: “because we live in a world of very hard problems—all the low-hanging fruit is gone—many of the most important challenges exceed the capabilities of the individual imagination. As a result, we can find solutions only by working with other people” (loc. 2139).

As evidence that more creativity can be squeezed out of groups than individuals, and that today’s problems require a collective effort more than ever before, Lehrer points to a study done by Ben Jones of the Kellogg Business School. Jones investigated scientific production over the past 50 years by looking at both patents and peer-reviewed papers. What Jones found is that successful patents and papers are increasingly coming from group efforts, and that these groups are growing in size, “with the average team increasing by about 20 percent per decade” (loc. 2144).

The increasing size of groups here is more than just a trend, it is an indication that only collective efforts are strong enough to produce successful patents and papers, and that the size of the networks needed to produce these successes has been growing over time. For Lehrer, the reason why this is the case is simple. It has to do with the fact that “the biggest problems we need to solve now require the expertise of people from different backgrounds who bridge the gaps between disciplines. Unless we learn to share our ideas with others, we will be stuck with a world of seemingly impossible problems. We can either all work together or fail alone” (loc. 2151).

6. Informal Interactions

As mentioned above, one of the ways that corporations have begun to take advantage of group creativity is through horizontal sharing, a process whereby the members of each department in an organization share their triumphs and tribulations with the members of every other department, in the hopes that this cross-pollination will spur new ideas and innovations.

Some very notable companies take this principle of cross-pollination so seriously that they have begun to redesign their workspaces around it. For instance, soon after Steve Jobs took over the animation company Pixar in 1986, he designed the building that housed his new project to center around a huge airy atrium (loc. 2288). The building was specifically designed in such a way that the workforce would have to pass through the atrium as much as possible (everything important in the building was located in or beside the atrium, from the meeting rooms, to the cafeteria, to the mailboxes, and even the bathrooms [loc.2297]). The reasoning behind this design was simple: Jobs’ wanted his employees to interact with one another as much as possible; he himself stressed that “everybody has to run into each other” (loc. 2300). Ed Catmull, a leading computer scientist with Pixar puts it this way: “what’s our most important function? It’s the interaction of our employees. That’s why Steve put a big empty space [at the center]. He wanted to create an open area for people to always to be talking to each other” (loc. 2291).

The strategy seems to be working. Darla Anderson, an executive producer with Pixar, was sceptical at first (loc. 2296), but when she experienced the strategy at play, she changed her tune. Speaking of Jobs, Anderson claimed that “he really believed that the best meetings happened by accident, in the hallway or parking lot. And you know what? He was right. I get more done having a bowl of cereal and striking up a conversation or walking to the bathroom and running into unexpected people than I do sitting at my desk” (loc. 2300). Even aside from the employee testimonials, though, it is difficult to disagree with anything that Pixar is doing, as their track record speaks for itself—the eleven feature films that they’ve released since 1995 have grossed an average of \$550 million per film, and won a total of 24 Academy Awards, 6 Golden Globes and 3 Grammys (loc. 2213-2218).

Here is the short feature that got Pixar off and running (and won them their first Oscar [loc. 2264]) in 1988:

Beyond the circumstantial evidence though, there is good scientific evidence to believe that increased employee interactions is an excellent recipe for success. For instance, Tom Allen, a professor of organization studies at MIT, undertook a study involving the interactions of the employees at a number of large corporate labs (loc. 2336). Interestingly, Allen found that the most productive employees were the ones who engaged in the most interactions with their colleagues: “after analyzing the workplace data, he realized that the highest-performing employees—those with the most useful ideas—were the ones who consistently engaged in the most interactions. ‘High performers consulted with anywhere from four to nine organizational colleagues [on a given project], whereas low performers contacted one or two colleagues at most’” (loc. 2344).

A similar study was performed by the sociologist Brian Uzzi, but this time on the financial traders of a large hedge fund (loc. 2347). Again, though, the same results emerged. Uzzi found that the most successful traders were the ones who carried on the most text-messaging conversations with their colleagues: “the best traders were the most connected, and people who carried on more IM conversations and sent more messages also made more money. (While typical traders generated profits on only 55 percent of their trades, those who were extremely plugged in profited on more than 70 percent of their stock trades)... By contrast, the least successful traders tended to engage in the fewest electronic chats” (loc. 2364).

7. Group Projects & The Power of Q

While informal interactions may be an important contributor to creativity and productive output, sometimes groups of people need to work together closely and collaboratively in a more formal way—on a particular project, say. Now, it goes without saying that you can’t just throw a group of people together and expect that they’ll work well with one another and churn out creative results. Instead, you need the right mix of people, and the right approach.

In an effort to determine just what the right mix of people for a group project consists in, Brian Uzzi (the same sociologist just mentioned above) undertook a major study of nearly every Broadway musical produced over the past 100 years (loc. 2163). Uzzi considered the Broadway musical to be an optimal launching pad to study collaborative dynamics since it requires the collective effort of so many different types of people. For example, “the composer has to write songs with a lyricist and librettist, and the choreographer has to work alongside the director, who is probably getting notes from the producers” (loc. 2159).

Now, the Broadway musical community tends to be a fairly tight one, in that many of the contributors are known to one another, and have worked together on one project or another (loc. 2167). However, what Uzzi noticed is that there was still a wide discrepancy between musicals in terms of how familiar the collaborators were with one another, and how often they had worked together before. Uzzi then formulated a term to help capture the degree of relatedness of the collaborators on any given musical, and called this variable *Q*. For instance, Lehrer explains, “if a musical was being developed by a team of artists who had worked together several times before—this is common practice on Broadway, since producers see ‘incumbent teams’ as less risky—that musical would have an extremely high *Q*. In contrast, a musical created by a team of strangers would have a low *Q*” (loc. 2171).

Now, one might expect that the Broadway musicals with the highest *Q* scores would be the most successful, for the more familiar the collaborators are with one another, the better we would expect them to work together, and hence the more successful we would expect their productions to be. However, this is not what Uzzi found. Instead, Uzzi found that the most successful Broadway musicals were the ones that had an intermediate level of *Q*: “a musical produced at the ideal level of *Q* (2.6) was two and a half times more likely to be a commercial success than a musical produced with a low *Q* (<1.4) or a high *Q* (>3.2). It was also three times more likely to be lauded by the critics” (loc. 2189).

Now, this does not mean that the most successful musicals were the ones where all of the collaborators knew one another to the same middling degree. Rather, Uzzi found that the most successful teams were the ones where a good portion of the collaborators knew one another quite well, and which collaborators were joined by a moderate amount of new and unfamiliar talent. As Uzzi himself explains it, “the best Broadway teams, by far, were those with a mix of relationships... These teams has some old friends, but they also had newbies. This mixture meant that the artists could interact efficiently—they had a familiar structure to fall back on—but they also managed to incorporate some new ideas. They were comfortable with one another, but they weren’t *too* comfortable” (loc. 2193).

As an extra bit of evidence that this mix of people is precisely the one that leads to success, Lehrer cites the fact that it is also the one that Pixar employs when it puts a project team together. For instance, Pixar relies on its brain trust of 10 directors to hash out the initial plot of a film, and then sends this sketch out to an independent screenwriter to write the script (loc. 2529). As Lehrer explains “it’s one of the many ways they inject fresh voices into the process, ensuring the team maintains the right level of *Q*” (loc. 2529).

8. Group Project Strategies: Brainstorming Vs. Constructive Criticism

a. Brainstorming

Once you have the right team together, it's important that that team practice the right approach, for not all approaches are created equal. Now, the conventional wisdom is that the best way to get some good ideas out of a group is to begin with a solid session of brainstorming. As Lehrer points out, "brainstorming is the most popular creativity technique of all time. It's used in advertising offices and design firms, the classroom and the boardroom" (loc. 2411). You have almost certainly been part of a brainstorming session yourself at one time or another (if not hundreds), and will therefore know that one of the key protocols of these sessions is that you are not to criticize anyone else's views (loc. 2407, 2411). Your only job is to come up with as many ideas as possible in as short a time as possible (loc. 2411).

Alex Osborn, who coined the term 'brainstorming'—and who wrote a string of best-selling books about the practice in the 1940's and 1950's—emphasized just how important it is that there be an absence of criticism in a brainstorming session; for, he wrote, "creativity is so delicate a flower that praise tends to make it bloom, while discouragement often nips it in the bud" (loc. 2411). Osborn also added that "in order to increase our imaginative potential, we should focus only on quantity. Quality will come later" (loc. 2411).

As reasonable as this argument sounds, it turns out that it is just plain false. To begin with, several studies have compared brainstorming with an alternative strategy where group members are required to come up with ideas on their own. The results of the studies are clear: "Keith Sawyer, a psychologist at Washington University, summarizes the science: 'Decades of research have consistently shown that brainstorming groups think of far fewer ideas than the same number of people who work alone and later pool their ideas' (loc. 2419). What's more, the same research also showed that the quality of ideas produced in brainstorming sessions is inferior to that produced by individuals working on their own. For instance, in the original study of this kind, "not only did the solo students come up with twice as many solutions as the brainstorming groups but their solutions were deemed more 'feasible' and 'effective' by a panel of judges" (loc. 2424).

b. Constructive Criticism

The main problem with brainstorming, it seems, is that the very lack of criticism that is meant to allow creative ideas to bloom and flourish, actually ends up doing just the opposite. Indeed, it appears that a healthy measure of criticism is actually an integral component in contributing to the best ideas. In support of this, consider the study performed by the UC-Berkely psychologist Charlan Nemeth. Nemeth split her subjects into 3 groups, and assigned each group a different strategy for solving a given problem about traffic congestion (loc. 2436). The first group was given no specific instructions, but were instead allowed to confront the problem in any way that they chose (loc. 2436). The second group was assigned to engage in a brainstorming session (and to be careful not to criticize each other's ideas) (loc. 2436). Finally, the third group was asked to be just as freewheeling

in their offerings as the brainstorming team, but were also encouraged to debate and criticize each other's ideas (loc. 2440). The study produced a clear winner: "while the brainstorming groups slightly outperformed the groups given no instructions, people in the debate condition were far more creative. On average, they generated nearly 25 percent more ideas" (loc. 2446). In addition, after the sessions themselves had ended, the researchers asked each of the participants if they had had any more ideas that had been triggered since the conclusion of the sessions. Here, "while people in the minimal and brainstorming conditions produced, on average, two additional ideas, those in the debate condition produced more than seven" (loc. 2446). This lead Nemeth to conclude that "while the instruction 'do not criticize' is often cited as the [most] important instruction in brainstorming, this appears to be a counterproductive strategy. Our findings show that debate and criticism do not inhibit ideas but, rather, stimulate them relative to every other condition" (loc. 2449).

So, why is it that criticism encourages creativity, while the lack thereof stifles it? There appears to be two main reasons here. First, when we are encouraged to criticize others' ideas we listen more intently to, and are more engaged with them, and also strive to improve their ideas with our own: "we think about their concepts because we want to improve them; it's the imperfection that leads us to really listen" (loc. 2454). By contrast, when criticism is discouraged there is less room to engage with other people's ideas, and so less room to build upon them. As Lehrer explains, "when everybody is 'right'—when all new ideas are equally useful, as in a brainstorming session—we stay within ourselves. There is no incentive to think about someone else's thoughts or embrace unfamiliar possibilities" (loc. 2459).

The second reason why criticism encourages creativity appears to be because the act of dissent in itself entices us to think outside the box. Indeed, this is an effect that has been shown experimentally, in the lab (loc. 2465). As Lehrer explains, "it doesn't matter if you're trying to invent a new brand name or decipher a hard insight puzzle. Beginning a group session with a moment of dissent—even *when the dissent is wrong*—can dramatically expand creative potential" (loc. 2474).

As evidence that a dose of healthy criticism does in fact work out in the field, Lehrer once again cites the company Pixar. Pixar, as it turns out, is a big fan of constructive criticism. Indeed, the company relies heavily on the strategy, as every workday begins with an intense session of what they call 'plussing'. Here's how plussing works: "a few dozen animators and computer scientists gather in a small screening room filled with comfy velour couches... Then the team begins analyzing the few seconds of film produced the day before, ruthlessly shredding each frame... No detail is too small to tear apart" (loc. 2384). The participants are encouraged to criticize each other's ideas as much as possible, but there's one catch: if you're going to criticize an idea, you must also offer a way to improve it (hence why the

session is called 'plussing'). This not only allows for new and better ideas to build up, but also keeps the criticism from being overly-demoralizing, and also keeps the session itself from being overly-confrontational (loc. 2484-88).

Section 2: Creativity in Cities

9. The Superlinear Creativity of Cities

Now, creativity not only emerges from individuals and groups, but also emerges out of cities. Indeed, as Lehrer points out, cities are hotbeds of creativity. In fact, cities are not just hotbeds of creativity, they are hotbeds of productivity of any sort—at least in any variable of this kind that can be measured, “from the production of patents to per capita income” (loc. 2812). And as a general rule, the bigger the city, the more creative and productive its inhabitants are. Interestingly, this increase in creativity and productivity even follows a precise mathematical curve based on a city’s population. Even more interesting is that this mathematical curve is not linear but to an exponent of 1.15 (loc. 2815). What this means is that every time a city doubles in population its inhabitants become 15 percent more productive (loc. 2815). In more concrete terms, the theoretical physicist (and the man behind this research) Geoffrey West explains that “you can take the same person, and if you just move them from a city of fifty thousand to a city of six million, then all of a sudden they’re going to do three times more of everything we can measure. It doesn’t matter where the city is or which cities you’re talking about. The law remains the same” (loc. 2819). This superlinear scaling of growth in production, West argues, has no equivalent in nature (loc. 2832), and for him makes cities the most important invention in all of human history (loc. 2828).

So, just how do cities draw creativity from their inhabitants? In many ways a city is analogous to a group, which is itself analogous to an individual brain: it is the nodes and connections that make them all work. As we might expect, then, there is a direct correlation between the number of nodes and connections in a city (read people and interactions) and its level of creative output. What’s more, because connections build on connections, and ideas build on ideas, there is room for superlinear, as opposed to just linear, growth. The artist (and former lead man of the band ‘Talking Heads’) puts it this way: “If you look and listen in a city, then your mind gets expanded automatically... You can say “I know that’s possible because I saw somebody else do this.” And then you take that and maybe without even knowing it you start to put it in your own music” (loc. 2685).

10. Population Density & The Power of Interactions

Now, while the productive output of the inhabitants of a city may neatly follow the exponent of 1.15, it is not the case that all cities fall precisely on this curve. Some cities are a little above this curve, while others are a little below it, and still others are real outliers in either direction (loc. 2836-45, 2878). So, how can we explain the exceptions here?

One important factor is the population density of a city. That is, how tightly packed-together the inhabitants are. Cities that are more densely populated tend to be more creative and productive than those whose populations are more spread out. Indeed, as Lehrer notes, “several economic studies have found that doubling urban density raises productivity by up to 28 percent” (loc. 2869). This is a big reason why suburban areas (which are very sparsely populated) tend to be less creative and productive than urban areas (loc. 2865-69) (more on this below).

The reason why population density affects the creativity and productivity of a city is fairly simple: it has to do with the fact that the more tightly packed-in people are, the more interactions take place between them, thus leading to more information and idea sharing, and hence more growth of this information and these ideas (this process is called ‘knowledge spillover’, a term coined by the famous urban theorist Jane Jacobs [loc. 2750]). West and his colleague Luis Bettencourt “attempt to explain this... by invoking the language of physics. They compare urban residents to particles with velocity bouncing off one another and careening in unexpected directions. The more creative cities are simply the ones with the most collisions” (loc. 2857).

As an example here, consider the American city of Phoenix. Phoenix has been one of the fastest growing cities in the U.S. for decades (loc. 2865). In its growth, though, Phoenix has “trad[ed] away crowded public spaces and knowledge spillovers for single-family homes” (loc. 2865). In other words, Phoenix has eschewed urban growth in favor of sub-urban growth. It comes as no surprise, then, that Phoenix “has had below-average levels of income and innovation for the last forty years” (loc. 2869).

Of course, there are exceptions to the rule here. Consider Silicon Valley. Silicon Valley is highly suburban and is yet one of the most creative and productive places in all of American—indeed the entire world (loc. 2904). For Lehrer, though, there is a very good reason why Silicon Valley was able to gain (and has been able to keep) its creative edge. This has to do with the fact that while the area may well be very spread out, the culture there is still highly interactive. For one thing, when the tech boom started there, most of the firms were very small (loc. 2928); as a result the firms themselves had to collaborate on projects in order to get them done (loc. 2928). As Lehrer explains, “this meant that the industrial system of the San Jose area wasn’t organized around individual firms. Instead, the region was defined by its professional networks, by groups of engineers trading knowledge with one another” (loc. 2936).

This spirit of networking and social interaction can also be seen in San Jose's lively nightlife. The effervescent nightlife and 'schmoozing' of the San Jose area was first described in a profile written by Tom Wolfe in 1983 (loc. 2936). As Lehrer reports, the "California suburbs... have managed to create their own version of Greenwich Village. They don't bump into one another on the crowded sidewalk or gossip on the stoop of a brownstone. Instead, they meet over beers at the Wagon Wheel, or trade secrets at the Roundhouse" (loc. 2945).

The fact that the people of Silicon Valley continue to meet face to face, as opposed to just staying connected electronically, is an important point. According to Lehrer, while social media such as facebook and twitter certainly have their uses (loc. 3112), there is real evidence to show that they cannot replace face to face interactions. For instance, it has been demonstrated that people cooperate and solve problems much more efficiently when they are together in the same room, than when they are limited to electronic communication (loc. 3101). Also, a study of peer-reviewed papers by Isaac Kohane of the Harvard Medical School revealed that "when coauthors were located closer together their papers tended to be of significantly higher quality, as measured by the numbers of subsequent citations. In fact, the best research was consistently produced when scientists were working within ten meters of one another, while the worst papers tended to emerge from collaborators located a kilometer or more apart" (loc. 3109). In light of this, Kohane concluded that "'if you want people to work together effectively, these findings reinforce the need to create architectures and facilities that support frequent physical interactions'" (loc. 3109).

11. Diversity

Aside from being sparsely populated, there is one other reason why suburbs tend to be less creative than urban areas, and this had to do with their homogeneity. Indeed, while suburbs tend to be made up of a single social and economic class, urban areas are a mix of every type of person imaginable. Given that this is the case, urbanites tend to be exposed to a much wider spectrum of information and ideas: "because cities force us to mingle with people of different 'social distances'—we have dinner parties with friends, but we also talk to strangers on the street—we end up being exposed to a much wider range of worldviews" (loc. 2753). And this exposure to a wider range of worldviews contributes to our own creativity (loc. 2679-97).

It was Jane Jacobs who first pointed out the importance of diversity in cities back in the 1960's. In fact, it was for this very reason that Jacobs advocated the form of urban development that she did: mixed-use neighborhoods. These are neighborhoods where there is a mix of businesses and residences catering to all levels of the social and economic spectrum: "the streets [are]... filled with apartments and retail shops and restaurants, which

mean[s] that different kinds of people [are] on the street for different reasons at different times of the day. The end result [is] a constant churn of ideas as strangers learn[] from one another” (loc. 2748).

Now, while Jacobs did not have the mathematics to back up her claims, West and Bettencourt do, and they agree with her wholeheartedly (loc. 2808). If you want to get the most creativity and productivity out of a city, aim for a high population density, and as much diversity as possible.

12. What Companies Can Learn from Cities

One final note on creativity and productivity in cities and companies. West and Bettencourt discovered that while cities tend to increase in creativity and productivity as their populations grow (again, to an exponent of 1.15), companies do not enjoy this same effect as they grow in size. Instead, the rate of increase in the productivity of companies is .9—a sublinear growth curve (loc. 3137). According to West, the reason why companies fail to keep up with cities is clear. It is because as companies grow, they tend to turn their focus towards efficiency at the expense of innovation and creativity, and this shift has none but a negative effect (loc. 3140). As Lehrer explains, “instead of imitating the freewheeling city, these businesses minimize the very interactions that lead to new ideas. They erect walls and establish hierarchies. They keep people from relaxing and having insights. They stifle conversations, discourage dissent and suffocate social networks. Rather than maximizing employee creativity, they become obsessed with minor efficiencies” (loc. 3141).

Eventually, the loss of creativity affects the bottom line, and soon enough the company is unable to keep up with its competitors (loc. 3143-47). It is no accident that the corporate cemetery is full of former giants. As Lehrer points out, “only two of the original twelve companies in the Dow Jones Index are still in business, while 20 percent of the companies listed in the Fortune 500 disappear every decade” (loc. 3135).

Unlike companies, cities cannot be over-managed. In fact, they can hardly be managed at all. As West explains, “Mayors can’t tell people where to live or what to do or who to talk to. Cities can’t be managed, and that’s what keeps them so vibrant. They’re just these insane masses of people bumping into each other and maybe sharing an idea or two. And it’s that spontaneous mixing, all those unpredictable encounters, that keeps the city alive” (loc. 3155). Certain companies like Pixar, and even the think tank where West and Bettencourt work (the Sante Fe Institute [loc. 3155]), have begun to take this lesson to heart. And it is just these types of companies and organizations that have managed to buck the trend of the sublinear business production curve.

Section 3: Creativity in Cultures

13. The Problem of Excess Genius & The Key Factors of Creativity in Cultures

The last stop on Lehrer's tour has to do with creativity at the level of culture. For Lehrer, the fact that certain cultures are more creative than others can be seen from the phenomena that the statistician David Banks of Duke University calls 'The Problem of Excess Genius' (loc. 3172). The problem of excess genius has to do with the fact that human geniuses are not spread out evenly over time and space; rather, "they tend to arrive in tight, local clusters. (As Banks put it, genius 'clots inhomogenously')" (loc. 3176). An example of this is Athens in the period between 440 BC and 380 BC. As Banks points out, "the ancient city over that time period was home to an astonishing number of geniuses, including Plato, Socrates, Pericles, Thucydides, Herodotus, Euripides, Sophocles, Aeschylus, Aristophanes, and Xenophon" (loc. 3176). (Aristotle just narrowly misses this time frame himself, so it would not take much of a stretch to add him too).

Another example here is Florence between 1450 AD and 1490 AD: "In those few decades, a city of less than fifty thousand people gave rise to a staggering number of immortal artists, including Michaelangelo, Leonardo da Vinci, Ghiberti, Boticelli, and Donatello" (loc. 3180). The example that Lehrer relies upon most heavily in his analysis though is Shakespeare's London of the 16th century. Just "consider the list of geniuses who surrounded Shakespeare. There was Marlowe, of course, but also Ben Jonson, John Milton, Sir Walter Raleigh, John Fletcher, Edmund Spenser, Thomas Kyd, Philip Sydney, Thomas Nash, John Donne, and Francis Bacon" (loc. 3270).

For Lehrer, the fact that these cities (and others like them) managed to produce a glut of geniuses is no accident. Rather, it has to do with the fact that there were a handful of key cultural conditions that prevailed therein at the time in question. Lehrer points to four of these cultural conditions in particular. They are 1) The accessibility of education; 2) A certain cosmopolitanism; 3) An atmosphere that allows for, and even encourages, risk-taking; and 4) A balance between protecting intellectual property rights, and allowing old ideas to be used for the purposes of new innovations. We will now have a look at each in turn.

a. Education

When it comes to education, consider the example of Shakespeare's London. As Lehrer points out, a concerted effort was launched in England in the sixteenth century to educate the males of the middle class—"those sons of bricklayers and wool merchants and farmers" (loc. 3359). These efforts were reflected in the literacy rates of London at the time. As Lehrer notes, "there hadn't been this many readers in a city since ancient Athens. While historians estimate that less than 1 percent of English citizens could read in 1510, by the time

Shakespeare moved to the capital, the literacy rate was approaching 50 percent” (loc. 3237). Shakespeare himself attended a free grammar school at Stratford—a privilege that those of his father’s generation had not had access to (loc. 3363).

Now, it is true that Shakespeare did not benefit from a college education, as the vast majority of his writing peers had (loc. 3363-70). However, Shakespeare did have access to a vast store of literary works. Indeed, as Lehrer points out, London had recently experienced an enormous boom in publishing (loc. 3239); and Shakespeare was an avid (if not compulsive) reader (loc. 3275).

Nowadays, most everyone in the developed world has access to an education, of course. However, as Lehrer argues, not all educational regimens are created equal. The particular brand that he champions is that practised by such schools as the New Orleans Center for Creative Arts (NOCCA) in Louisiana (loc. 3384), and High Tech High, a charter school in San Diego (loc. 3480). These institutions have adopted a learning-by-doing approach, wherein rather than sitting and listening to lectures, the students are required to design and execute their own projects, under the supervision of teacher/mentors. At NOCCA, for example, “the students don’t sit in their chairs and listen to a long lecture... They don’t retrieve hefty textbooks or begin series of tedious exercises designed to raise their scores on a standardized test... Instead, the students spend their time creating: they walk over to their instruments and sketchbooks and costumes and get to work” (loc. 3414). A similar approach is practiced at High Tech High in San Diego, only the focus here is on technology rather than the arts (loc. 3485).

Here is a short clip about High Tech High:

Both NOCCA and High Tech High have outstanding success rates. For instance, virtually every single student who passes through their halls goes onto college (loc. 3392, 3493), and the overwhelming majority of them are successful there (loc. 3493). What’s more, a number of NOCCA’s alumni have gone on to become important artists, including “Wynton and Brandford Marsalis, Wendell Pierce, Terence Blanchard, Anthony Mackie, Harry Connick Jr., and Trombone Shorty” (loc. 3396).

It is true, Lehrer admits, that most of the students that attend either NOCCA or High Tech High will not turn out to be professional artists or even technological innovators. However, he contends that what the students learn at these institutions will allow them to be successful no matter what they end up doing. As Lehrer puts it, “these students will leave the school with an essential talent, which is the ability to develop his or her talent. Because they spend five hours every day working on their own creations, they learn what it takes to get good at something, to struggle and fail and try again. They figure out how to dissect problems and cope with criticism” (loc. 2448). If we want our society to have a creative edge, Lehrer argues, we should start setting up more schools like NOCCA and High Tech High (loc. 3477).

b. Diversity & Cosmopolitanism

The second cultural condition that Lehrer focuses in on is the presence of diversity and cosmopolitanism. Shakespeare's London provides an excellent example of this. As Lehrer explains, "Elizabethan England... experienced an unprecedented mixing of its population. Some of this mixing was born of urban density, as people flocked to London from all over the country. However, the period was also marked by the rise of international trade and the emergence of a merchant class that moved freely across national borders" (loc. 3571). What's more, Lehrer adds, this mixing was particularly poignant in the theatre district where Shakespeare worked, as "most of the[] new theaters were built on the outskirts of London, next to brothels, prisons, and lunatic asylums" (loc. 3204), which meant that there was always a motley crue of inhabitants in the district itself—and, of course, all manner of people came to watch the plays, from the lowest classes to the highest.

In order to incorporate more diversity in our societies, Lehrer argues, it is important that we encourage more immigration (loc. 3562). As evidence that immigration does indeed lead to more creativity, Lehrer cites the fact that immigrants account for a disproportionate amount of both new patents and new businesses: "according to the latest figures from the U.S. Patent Office, immigrants invent patents at double the rate of nonimmigrants, which is why a 1 percent increase in immigrants with college degrees leads to a 15 percent rise in patent production... These new citizens also start companies at an accelerated rate, cofounding 52 percent of Silicon Valley Firms since 1995" (loc. 3567).

c. Risk-Taking

The third cultural condition that Lehrer points to as an important contributor to creativity is an atmosphere that encourages risk-taking. Shakespeare himself was allowed to take risks in Elizabethan England due to the fact that the theater industry was so hot that it was starving for anything new (loc. 3192). In fact, it was this very thirst for the new that had previously allowed Christopher Marlowe, a contemporary playwright of Shakespeare's, to take a risk with a new form of writing known as blank verse. Blank verse was revolutionary in the theater world in that it "moved theater away from poetry... and toward narratives driven by their characters" (loc. 3212), and was a form of writing that Shakespeare himself would later take up and perfect in his most famous plays (loc. 3213).

An atmosphere that encourages risk-taking is necessary, Lehrer argues, since many of the most important ideas, innovations and businesses, represent a significant departure from what has gone before. And if those responsible for these novelties hadn't taken the risk of sticking their necks out with them, they would never have seen the light of day (loc. 3591-99). What's more, most of the people that have been responsible for the most important innovations had tried and failed before they became successful, so if they hadn't persisted with their risk-taking they would never have made it to where they arrived (loc. 3594).

To illustrate just how important it is to encourage risk-taking, Lehrer directs our attention to the funding strategy of the Howard Hughes Medical Institute (HHMI), “a large nonprofit set up to ‘push the boundaries of knowledge’” (loc. 3603). Now, the conventional approach to evaluating potential research projects is the perfectly reasonable one of scrutinizing the research plan in terms of the viability of the project (loc. 3606). However, HHMI eschews this approach in favor of one where potential projects are evaluated on the basis of the scientist’s previous research (loc. 3606-11). As Lehrer explains, “the assumption is that a creative scientist should be able to pursue ideas without having to justify them to a panel of experts. Sometimes the experiments with the most potential are still lacking evidence” (loc. 3612). By adopting this approach, HHMI allows its scientists to take much bigger risks in their research. In fact, the company openly encourages its researchers to “take risks, explore unproven avenues and embrace the unknown—even if it means uncertainty or the chance of failure” (loc. 3611).

In an effort to determine whether this strategy or the more conventional one is more effective, a team of economists out of MIT and UCSD set out to compare HHMI with a more conventional player in the industry; in this case NIH, “the largest funder of biomedical science in the world” (loc. 3603). The team found that the HHMI researchers did in fact produce more utter failures—indeed 35 percent more (loc. 3619). However, this was more than made up for by the successes. As Lehrer explains, “in every biomedical field, the risky HHMI grants were generating the most important, innovative, and influential research. Although HHMI researchers had qualifications similar to their NIH counterparts when they first applied for funding, they went on to produce twice as many highly cited research articles and win six times as many awards” (loc. 3619). So risk-taking yields results, and we can encourage more of it through well-designed practices and strategies such as HHMI’s (loc. 3269).

d. Intellectual Property Rights and Freedoms

The fourth and final cultural condition that Lehrer brings up in connection with increased creativity is a kind of balance between two competing forces. On the one hand is the security in knowing that one’s ideas will be protected from being plagiarized—which is necessary in order for one to invest the time and energy in coming up with these new ideas in the first place. And on the other hand is the freedom to use old ideas in novel ways to create new innovations. The first condition is achieved by way of adequately protecting intellectual property rights, while the latter condition is achieved by way of relaxing these property rights enough to allow old ideas to be borrowed and refashioned.

In Shakespeare’s time conditions heavily favored the freedom to borrow others’ ideas. And did Shakespeare ever! Indeed, as Lehrer points out, Shakespeare’s “peers repeatedly accused him of plagiarism” (loc. 3283). And they might have had a point. For instance, as Lehrer mentions, “the Henry VI plays were so deeply influenced by [Christopher Marlowe’s]

Tamburlaine that eighteenth-century scholars assumed Marlowe had written most of the lines" (loc. 3257). And of course, Shakespeare didn't just borrow from his peers, but from history books, popular pamphlets, poems etc. etc. (loc. 3275-83).

Today, on the other hand, the table is much more skewed towards the protection of intellectual property rights. Indeed, Lehrer contends that by contemporary standards Shakespeare probably would have been found guilty of plagiarism on numerous occasions (loc. 3283). However, this is not so much a condemnation of Shakespeare, but of today's standards, for as Lehrer argues, "Shakespeare didn't just read these texts and imitate their best parts; he made them his own, seamlessly blending them together in his plays" (loc. 3283). Indeed, for Lehrer, we have certainly gone too far today in protecting intellectual property rights at the expense of allowing people to borrow and recombine others' ideas. He argues that "in recent years, American creativity has been undermined by an abundance of vague patents and the recurring extension of copyright claims" (loc. 3637). According to the author, this trend is largely the result of the fact that the lobby behind protecting intellectual property rights has big business behind it, while "the public domain has no lobby" (loc. 3645). For Lehrer, this trend needs to be reversed if we are to strike the right balance to maximize creativity, claiming that "we have to ensure that people can be inspired by the work of others, that the commons remains a rich source of creativity" (loc. 3650).

14. Conclusion

So, for more creativity in your own life, concentrate and work hard, relax, and then concentrate again and work harder. For more creativity in your business or organization, make room for (and indeed encourage) random interactions, assemble teams with the right Q score, and then set these teams to work in a manner that relies on constructive criticism. For more creativity in your city, aim for high density and mixed-use neighborhoods. For more creativity in your society get education right, welcome immigration, encourage risk-taking, and strike a balance between protecting intellectual property rights and allowing people the freedom to borrow old ideas for the purpose of new innovations.

*To purchase the book at Amazon.com, please click here: [Imagine: How Creativity Works](#)

*Thank you for taking the time to read this article. If you have enjoyed this summary of Jonah Lehrer's 'Imagine: How Creativity Works' or just have a thought, please free to leave a comment below. Also, if you feel others may benefit from this article, please feel free to click on the g+1 symbol below, or share it on one of the umpteen social networking sites hidden beneath the 'share' button.

Cheers,

Aaron,

