

The Arbitrary Tyranny of Birth-dates and Deadlines¹

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FOR NEARLY FIVE THOUSAND YEARS, the belief that the great celestial bodies controlled the lives and destinies of men was considered fact. It existed (in some form) in nearly every major society on every continent. But while there were many variations and practices, perhaps the most familiar are the signs and constellations of the Western Zodiac (figure 1).

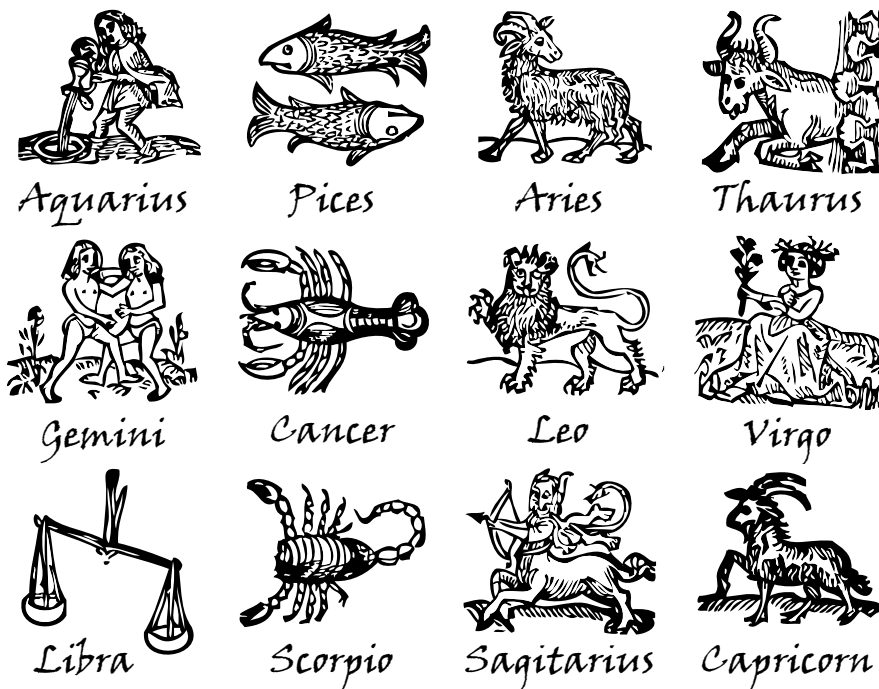
The western zodiac consists of the constellations that line the path of the sun over the course of the year. These constellations were thought to dominate the personality and destiny of those born under them. Thus, to many, their sign of the zodiac (which was determined by date of birth) was an extremely important thing.

Belief in the the zodiac has been remarkably persistent. It has changed little from the version that appears in the texts and tablets of ancient Greece. But while the core beliefs of the zodiac have been constant, it has lost the confidence of most adherents. They were snared away by competing philosophies of destiny and fate. During the enlightenment, in particular, much of the world stopped placing its faith in mystical actors (like stars) and instead started to place it in more rational alternatives (such as other human beings).

Individuals such as Thomas Jefferson, Benjamin Franklin, George Washington and other American Founding Fathers took this idea to its logical end. Some, like Jefferson attained success by micromanaging every part of their

¹ The data and analysis presented here first appeared in Malcom Gladwell's *Outliers*, published by Little, Brown and Company (2008).

Figure 1: The Western Zodiac (bottom) is a series of twelve constellations that line the path of the sun over the course of the year. Each constellation was thought to convey special personality traits and advantages to those born under it. Variations of this idea - such as the the Chinese Zodiac (right) which relates each year of a twelve year year cycle to an animal and its attributes - can be found in nearly every major society that has ever existed.



persona - in Jefferson's case, going to the extreme of writing his own epitaph.

Others, like Franklin, published auto-biographical works that advanced the notion they had risen to prominence entirely by their own effort and initiative. This second belief, in particular, proved particularly popular and even won itself a name: the "Self-Made Man".

Self made men ... [are those] ... who owe little or nothing to birth, relationship, family surroundings; to wealth inherited or to early approved means of education; who are what they are, without the aid of any of the favoring conditions by which other men usually rise in the world and achieve great results.²

The allure of being "self-made" was so enticing that it has become inseparably entwined with American perceptions of success. As Malcolm Gladwell notes in his book, *Outliers*:

What is the question we always ask about the successful? We want to know what they're like - what kind of personalities they have, or how intelligent they are, or what kind of lifestyles they have, or what special talents they might have been born with that explain how that individual reached the top.³

Put another way, we want to know how we can emulate them.

EVERYONE IS FAMILIAR WITH SUCH STORIES OF SUCCESS. In them, an intelligent, talented and charismatic protagonist rises through adversity and difficulty to fame, wealth and power. All the while demonstrating that, "Every man is the master of his own destiny."

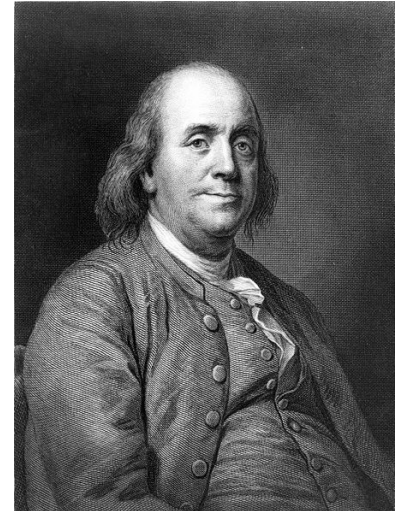
But though inspiring, this familiar story is also boring. It assumes that anyone can harness and shape their surroundings; and that other factors - family, background, culture or even fate - have either a marginal or non-existent effect. By accepting the story at face value, we deny ourselves the opportunity to ask more interesting and salient questions, such as "How does a person earn the opportunity to rise from obscurity?" or "What other factors might have contributed?"

In trying to tackle these questions, it might be worthwhile to start by re-assessing the wisdom of the ancients. Foolish ideas do not survive for millennium unchanged, nor do they gain near universal acceptance. In this article, I will take a look at the kind of power that a birth date - the event at the heart of the zodiac system - can exert on the destiny of an individual. In the process, I will put the theory of "self-made" success to the test.

Birth: An Arbitrarily Random Event

A society based upon the principles self-made success has a name; it is called a meritocracy. In it, responsibilities are assigned based upon demonstrated talent and ability. Moreover, opportunities are open to everyone. One institution that approaches a pure meritocracy is that of Canadian junior hockey.

Figure 2: Through his auto-biography, Benjamin Franklin first introduced the world to the idea of a man who owed nothing to parentage or patronage. He was later to be proclaimed a "self-made" man. *Image Source: Wikipedia*



² Douglass, F. (2003). *Narrative of the Life of Frederick Douglass, an American Slave, Written By Himself* (6 ed.), pp. 2032-97. New York: Norton

³ Gladwell, M. (2008). *Chapter One: The Matthew Effect* (1 ed ed.), Chapter 1, pp. 15-34. New York, NY: Little, Brown and Company

Thousands of Canadian boys begin to play the sport at the “novice” level, before they are even in kindergarten. From that point on, there are leagues for every age class, and at each of those levels, the players are sifted and sorted and evaluated, with the most talented separated out and groomed for the next level. By the time players have reached their mid-teens, the very best have been channeled into an elite league known as Major Junior A, which is at the top of the pyramid. And if your Major Junior A team plays for the Memorial Cup, that means you are at the very top of the top of the pyramid ...

You can't buy your way into Major Junior A hockey. It doesn't matter who your father or mother is, or who your grandfather was, or what business your family is in. Nor does it matter if you lie in the most remote corner of the most northerly province in Canada. If you have ability, the vast network of hockey scouts and talent spotters will find you, and if you are willing to work to develop that ability, the system will reward you. Success in hockey is based on *individual merit* – and both of those words are important. Players are judged on their own performance, not on anyone else's, and on the basis of their ability, not on some other ... fact. (*Outliers*, 17)

In such a system, arbitrary things – such as date of birth – should have minimal effect on who is talented and who is not. After all, a talented hockey player is just as likely to be born in August as he is in January. So, if we were to analyze the birth dates of hockey champions, they should be completely and thoroughly chaotic.

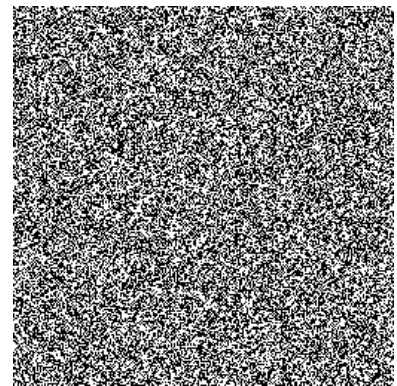
BUT WHAT DOES A CHAOTIC EVENT LOOK LIKE? For starters, it should be random. But that leads to another question, how can we be sure that an occurrence is actually random?

As it turns out, that's a very good question. It can be very difficult to definitively say that something is random, but it's easy to spot the general pattern; or, rather, the lack of one. For something to be truly random means that it must be selected from a set of possible values, each of which is equally likely. It's like a good six sided die. When you throw the die, you can't predict before hand what the result will be.

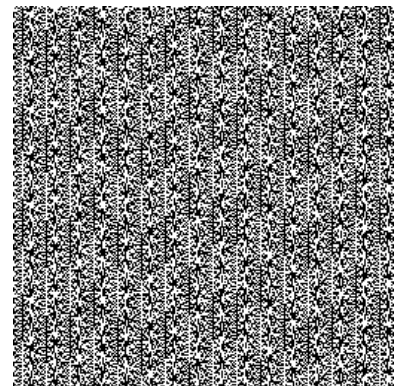
The question of whether something is random or not has been studied a great deal in computer science. The two graphics shown in figure 3 are relevant examples of this work. Both of these graphics were randomly generated by a computer using two different approaches. The first makes use of atmospheric noise, a random physical event, to create the graphic. The second uses a computer algorithm to do the same thing. But while the second graphic approximates a random selection of numbers, you can still see that there is a visible patterns amongst the chaos. That is to say, it isn't really random.

The underlying computer algorithm used to generate the graphic still has a degree of order to it. If we were to generate more examples, they would also have the same sort of lines and swirls. This is important because even though it may not be recognized, factors in the background are still exerting

Figure 3: A random number is one that is drawn from a set of possible values, each of which is equally likely. As a result, any event that is truly random should fail to exhibit a pattern. Below are two graphics which illustrate this point. *Image Source: Random.org*



(a) A graphic generated from a true random number generator which uses atmospheric noise (a random physical event). There is no visible pattern to the data.



(b) A graphic generated using a computer algorithm to calculate random values (known as a pseudo-random number generator). The presence of a discernible visual pattern shows that while the algorithm approximates chaos, it still has an underlying order to it.

an influence on the outcome.

EVEN THOUGH RANDOM EVENTS MAY LACK A DISCERNIBLE PATTERN on a case by case basis, they still follow the laws of probability. Imagine, for example, that you flip a coin 1000 times and keep track of whether it lands heads or if it comes up tails. At any given point in your coin tossing experiment, the coin may have come up heads five times in a row. Or it may have come up tails tens time in a row. While each of these “runs” might be unlikely, they are certainly possible.

But after one thousand flips, it is almost certain that the number of heads and the number of tails will be very close to the same value (about 500 each). This happens because each one of the outcomes (landing heads or tails) has an equal chance of happening; and as the numbers grow they tend to follow the probabilities. Thus, even though you might have flipped heads five times in a row, the number of times you flipped tails probably equaled it out.

In statistical parlance, this is called a *uniform* distribution.

THIS IS TRUE OF MOST ANY RANDOM EVENT. If there are a finite number of possibilities (like the two faces of a coin or the six heads of a die) and all of the outcomes are equally likely, then the events should happen in more or less the same frequency.

Which brings us back to questions of a child’s birth month. If month of birth really is a random event, it should be possible to predict the overall frequency of births.

Such a prediction is not only possible, but rather easy to calculate. The probability that a child will be born in a particular month works out to be 8.3%. But before any trust is placed in this hypothesis, we should look at the actual distribution of birth months in Canada.⁴

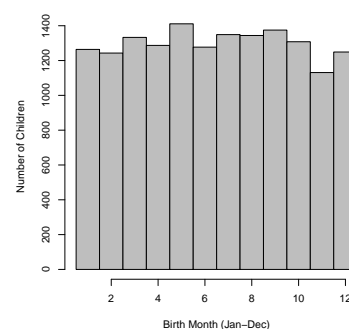
Figure 4 shows the birth months of 15,571 Canadian school children. As you can see, the number of births per month is remarkably close to the estimate: January (8.11%), February (8.0%), March (8.5%), April (8.3%), May (9.1%), June (8.2%), July (8.6%), August (8.6%), September (8.8%), October (8.4%), November (7.2%), December (8.0%). This appears to support the conclusion that the birth month of Canadian children is largely a random event.⁵

The Birth Months of Canadian Hockey Players

But what about the birth day and month of elite Canadian amateur hockey players? To answer this question, let’s take a look at the roster of the Medicine Hat Tigers, the Major Junior A team which won the Memorial Cup in 2007.⁶ If Canadian hockey is a true meritocracy, the distribution of the day of birth and month of birth should resemble that seen in figure 4. That is to say, it should be uniform.

Uniform Distribution. In a distribution which is statistically uniform, each outcome is equally likely.

Figure 4: The birth months of 15,571 Canadian Children from four provinces: Alberta, British Columbia, Ontario and Quebec.



⁴ We arrive at 8.3 percent by dividing by the number of possible birth months. $1/12 = 0.083$ or 8.3%

⁵ The data used to calculate the birth months of the Canadian children was taken from the Trends in International Mathematics and Science Study (TIMSS). TIMSS is a multinational study given every four years to randomly selected 4th and 8th graders. Additional information is available on their website at: <http://nces.ed.gov/timss/>

⁶ The complete roster can be found on pages 31-32 of Outliers.

Figure 5 shows a histogram of the day of the month when the players were born.⁷ Like the plot of birth months above, there isn't any exciting trend. There isn't any trend at all. The distribution is highly uniform and appears to be random.

SINCE THE DAY OF BIRTH APPEARS TO BE A RANDOM OCCURRENCE, can the same be said about the month? Figure 6 shows a histogram similar to that in figure 5, except it's been sorted by the month of birth rather than the day. Notice any differences?

First, there is an incredible number of birthdays in January, February, March and April. In fact, these four months account for more players than the rest of the year combined. Second, there is a distinctive lack of players born in the last few months of the year. This is clearly not a uniform distribution.

Nor is the roster of the Medicine Hat Tigers unique. If you look at the distribution of birth months for all players in the Ontario Junior Hockey League and the Western Hockey League,⁸ you notice a similar trend. The majority of players are born in January, with February and March tying closely for the second and third place spots.

The differences between the number of high level players born in January to those born during later parts of the year is absolutely striking, there must be something that is influencing the results. Nor can it be assumed that it is something purely environmental, such as weather during conception or birth, as the strikingly dissimilar results between January and December show.

The month of birth makes an enormous difference in who is given the chance to play elite amateur (and later professional) hockey. But why?

IT TURNS OUT THAT THE REASON IS QUITE SIMPLE, and is only tangentially connected to the month of birth or the influence of celestial powers. Rather, it's a consequence of another arbitrary discriminator: deadlines and cutoff dates.

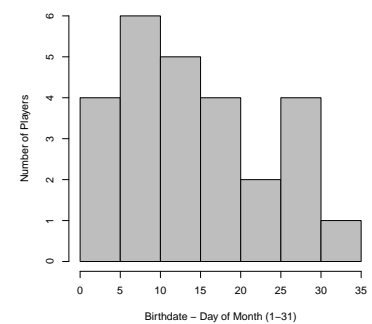
In Canada, the eligibility cutoff for age-class hockey is January 1. A boy who turns ten on January 2, then, could be playing alongside someone who doesn't turn ten until the end of the year - and at that age, in preadolescence, a twelve month gap in age represents an enormous difference in physical maturity ...

Coaches start to select players for the traveling "rep" squad - the all-star teams - at the age of nine or ten, and of course they are more likely to view as talented the bigger and more coordinated players, who have had the benefit of extra months of maturity.

And what happens when a player gets chosen for a rep squad? He gets better coaching, and his teammates are better, and he plays fifty or seventy-five games a season instead of twenty games a season like those left behind in the "house" league, and he practices twice as much, or even three times much more than, he would otherwise. In the beginning, his advantage isn't so much that he is inherently better, but only that he is a little older. But by the age of thirteen or fourteen, with the benefit of better coaching and all that extra practice under

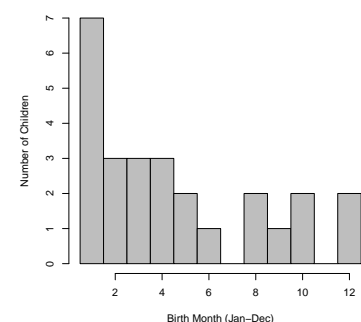
⁷ Due to the relatively small number of players on the team, the birth dates were grouped into seven separate categories using the Sturges method. Each category covers five days of the month (days 1-5, 5-10, 10-15, 11-20, 21-25, 26-30, day 31).

Figure 5: Is there a preferred day of the month for a championship hockey player to be born? In this histogram of the birth days for players on the Medicine Hat Tigers (2007 Major Junior A Canadian hockey champions), there is little variation. This provides evidence that the day of birth is a random event.



⁸ Barnsley, R., A. Thompson, and P. Barnsley (1985). Hockey success and birth-date: The relative age effect. *Journal of the Canadian Association for Health, Physical Education and Recreation Nov-Dec*, 23-28

Figure 6: Is there a preferred birth month for championship hockey players? Unlike in the histogram of birth days (figure 5), this plot shows a clear non-random pattern. It provides evidence that hockey players are far more likely to be born near the beginning of the year than they are at the end of the year.



his belt, he really *is* better, so he's the one more likely to make it to the Major Junior A league. (*Outliers*, 24-25)

Like the computer algorithm that is supposed to generate random numbers, Canadian hockey is a pseudo-meritocracy. While it tries to award opportunities based on individual talent, there are dramatic background forces that realign the outcome.

A Global Effect?

Though the results are dramatic, Canadian hockey is not alone in creating a huge advantage for those who are born closest to the cutoff date. It can be seen in any activity where three things happen: selection, streaming and differentiated experience.

If you make a decision about who is good and who is not good at an early age; if you separate the “talented” from the “untalented”; and if you provide the “talented” with a superior experience, then you're going to end up giving a huge advantage to the group of people born closest to the cutoff date. (*Outliers*, 25)

For the purposes of comparison, let's look at a second example of the same phenomenon. For much of the world, the system for finding and promoting elite soccer players is virtually identical to that used for spotting Canadian hockey talent. And like hockey, they use a January 1st cut-off date. Figures 7 and 8 show the histograms for day of birth and month of birth, respectively, for the 2007 Czech National Junior Soccer team.

Just like the Medicine Hat Tigers, the number of players born on different days throughout the month is more or less random; and the number of players born in the months nearest the cutoff date is not. Here, however, the effect is even more dramatic than in the hockey example. In total twelve children were born either in January or February. That's more than were born in all other parts of the year *combined!* And not one single player was chosen from amongst those born in the last three months of the year (October, November, December).

Winter Birthdays and Season Wins

Clearly, the cut-off date has a huge effect on who is able to play in competitive amateur and professional sports, but does it influence other outcomes as well? Might it, for example impact the overall success of the team? Do professional teams with higher numbers of players born in January, February or March win more games than those with fewer numbers of players with the “perfect birth date”?

Figure 9 investigates the relationship between the percentage of players with the “ideal” birth-date for a professional hockey player and the overall 2008 - 2009 season records for 11 NHL teams.⁹ Here, finally there is a bit of

Figure 7: Day of birth for the 2007 Czech National Soccer Team

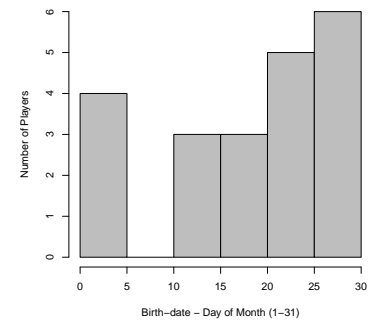
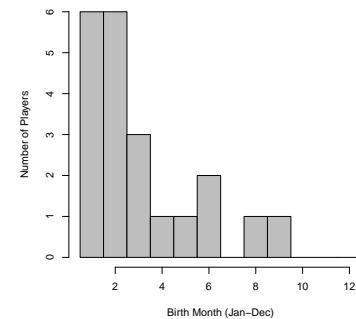


Figure 8: Month of birth for the 2007 Czech National Soccer Team



⁹ The data for this analysis was collected from publicly available NHL team rosters and rankings at <http://www.espn.com>. The 11 teams were selected at random.

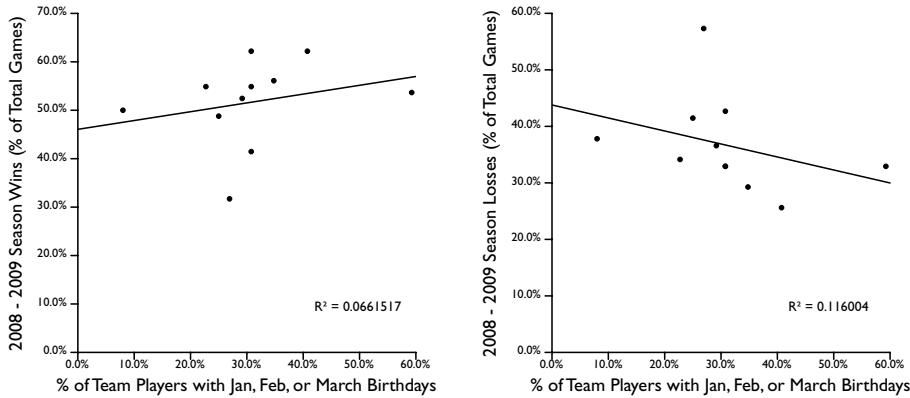


Figure 9: Wins and Losses. The graphs show the relationship between the number of players with the “ideal” birth-date for a professional NHL player (January, February or March) and the total 2008 - 2009 season wins (left) and losses (right) of their teams.

good news. Despite a loose association between some of the data, birth-date does not appear to affect the overall performance of the team. The destructive effect of birth-dates and deadlines is limited to impacting those who are able to participate in elite athletics rather than handicapping the afflicted forever.

Combating an Arbitrary Tyranny

The ancients clearly understood that arbitrary factors such as birth can have an enormous effect on potential opportunities. It is therefore, ironic, that so many in the modern world fail to notice such hidden influences or even attempt to dismiss them as “nonsense”. In the cases of elite hockey, the selection of something as simple as a cut-off date can greatly impact those who are able to compete versus those who are not.

The story of hockey and birthdays also tells us something important about our definitions of success. As Gladwell notes:

It tells us that our notion that it is the best and brightest who effortlessly rise to the top is much too simplistic. Yes, the hockey players who make it to the professional levels are more talented ... But they also got a big head start, an opportunity that they neither deserved nor earned ...

The professional hockey player starts out a little bit better than his peers. And that little difference leads to an opportunity that makes the difference a bit bigger, and that edge in turn leads to another opportunity, which makes the initially small advantage larger still - and on and on ... (*Outliers*, 30 - 31)

The tyranny of birth-dates and deadlines also demonstrates that the concept of self-made success is a myth. *No one* can claim that they arrived to power, prestige and fame solely on their own strength of will. Some may travel via the avenue of family wealth while others frequent less understood routes; but in both cases, the details of the journey are infinitely more complex and interesting than the “inspirational” story with which we are so aware.

This leaves us with a conundrum:

Because we so profoundly personalize success, we miss opportunities to lift others onto the top rung. We make rules that frustrate achievement. We prematurely write off people as failures. We are too much in awe of those who succeed and far too dismissive of those who fail. And most of all, we become far too passive. We overlook just how large a role we can all play ... in determining who makes it and who doesn't. (Outliers, 32)

So how do we combat an arbitrary tyranny?

First, we acknowledge that there is more to success and opportunity than personal merit; and then, we concede that the systems created to determine who gets ahead aren't tremendously efficient. (And in some cases, they may even be horribly broken.) Finally, we agree to do something about it.

Jefferson, Washington and Franklin took control of their destinies by challenging the premise that celestial powers could determine their fate. We can do the same by taking on a few of the misguided assumptions of our own society. In the next article of this series, I will look at a few examples in detail.

References

- [1] Barnsley, R., A. Thompson, and P. Barnsley (1985). Hockey success and birth-date: The relative age effect. *Journal of the Canadian Association for Health, Physical Education and Recreation Nov-Dec*, 23–28.
- [2] Douglass, F. (2003). *Narrative of the Life of Frederick Douglass, an American Slave, Written By Himself* (6 ed.), pp. 2032–97. New York: Norton.
- [3] Gladwell, M. (2008). *Chapter One: The Matthew Effect* (1 ed ed.), Chapter 1, pp. 15–34. New York, NY: Little, Brown and Company.