Pictures of Leadership:
An Interdisciplinary Examination of Leadership and What it Means to Each of Us

By Michael Nixon

I have a dream that one day on the red hills of Georgia, the sons of former slaves and the sons of former slave owners will be able to sit down together at the table of brotherhood.

I have a dream that one day even the state of Mississippi, a state sweltering with the heat of injustice, sweltering with the heat of oppression, will be transformed into an oasis of freedom and justice. […]

With this faith, we will be able to hew out of the mountain of despair a stone of hope. With this faith, we will be able to transform the jangling discords of our nation into a beautiful symphony of brotherhood. With this faith, we will be able to work together, to pray together, to struggle together, to go to jail together, to stand up for freedom together, knowing that we will be free one day.

-A "Leader"

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I am six. My stomach growls, even though it's only 11:00 AM my body knows that it's about to receive food. Anxious to eat, and go out to recess, we fidget in out places. From the mouth of the teacher at the front of the line comes "Michael, come to the front of the line, it's your turn to be the line leader." With pride, I stick out my chest and step forward to take my rightful place in the front of the line. Today I am no ordinary first grader. Today I am a line leader, and just as Moses lead the Israelites to the promised land, I will lead my fellow classmates to the sweet nourishment and activities our juvenile bodies crave.

I "lead."

I am twelve. I look at the wall before me—ten feet tall and 15 feet wide. At an even six feet, I stand head and shoulders above the members of my troop, but still the wall looms before me. I

look around, a waft of body odor hits my nose as I see the twenty-four pre-pubescent boys I call friends, none of which have showered for the past week look to me. As their leader, I must find a way to get every one of them over that wall. None can, nor will be left behind.

I "lead."

I'm 16. I am captain of the USS Odyssey, a spacecraft flown under the banner of the International Federation of Planets. In front of me display screens feed me real-time statistics and data about my ship and its surrounding, red lights flash and sirens wail notifying me that we are currently in a DEFCON 5 emergency, but I already know this, I'm the one who ordered it. While in the back of my mind I know this is all fake—that we are simply in a simulation— but in the moment it feels real. Behind me, I hear the shouts and frantic movement of my crew. After engaging in a fire-fight with an enemy ship, we are heavily damaged. The reports come back, there is little hope for salvation. We are at the mercy of our enemies…except one, highly dangerous option with an infinitesimally small probability of success. My decision made, I turn to my crew and give the order…

I "lead."

What is a leader? What is the meaning of this word that is so dynamic that we can use it to describe people with as much power as the President of the United States, and as little power as small six year-old Michael, first grade line leader. Why do we value that word so much? It's a word that has a nasty knack of finding its way into every scholarship application, job interview, and most biographies? What makes someone a leader? Now, I don't mean to ask about how one becomes a leader, or how a leader is chosen in the literal, procedural sense, rather I ask what it is about someone that makes us look at them and say to ourselves, whether consciously or unconsciously, "They are a leader, I'm going to follow them"? Finally, why is this leadership characteristic, or set of

characteristics, something that we value so much within ourselves, and others? Why do we seek to teach our children from a very young age how to lead?

At twenty-two years old, I am young and inexperienced concerning leadership, yet this is a title I have borne for much of my life. Indeed, leadership has seemed to be something that came naturally for me from the moment I left the womb. Nevertheless, the answers to the questions above often seem just as ambiguous as when I was born. Indeed, it seems to me that there are just as many definitions of leadership as there are leaders themselves. While I do not anticipate arriving at any solid answer throughout this paper, I do hope to shed some light on the truths and principles of leadership that we can learn from the world around us in hopes that we may come a little closer to understanding what it means to be a leader.

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From now on, America will be empowered by our aspirations, not burdened by our fears, inspired by the future, not bound by failures of the past, and guided by a vision, not blinded by our doubts.

I am asking all citizens to embrace this renewal of the American spirit. I am asking all members of Congress to join me in dreaming big and bold and daring things for our country. I am asking everyone watching tonight to seize this moment. Believe in yourselves. Believe in your future. And believe, once more, in America.

-A "Leader"

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I enter the Eyring Science Center, a building on campus that I am vaguely familiar with at best. To me, this building represents everything that is painful in life. This is the building that houses the disciplines of physics and astronomy, geology, and food science and nutrition, all of which tend to make my head spin so quickly that the speed can only be written in scientific notation. Don't get me wrong, I love the empirical disciplines. To me they are just…different and sometimes hard to

grasp. Nevertheless, I believe their views on leadership can offer me important insights and so, with a little bit of trepidation, my quest to find answers to leadership's deepest questions begins here.

I sit down with a professor of quantum physics who has been recommended to me by a peer, and after some introduction of myself and my project I begin my interview with the question, "How does your discipline define leadership?" The professor looks at me, lips curling into a slight smile, laughing quietly and responds, "By whoever is right." While the answer surprises me, the underlying logic does not. It is not surprising to me that when viewed from an empirical standpoint, leadership is as cut and dry as correct and incorrect. After all, in a world ruled by numbers and data it would defy all logic and reason to follow someone who the cold hard data says is wrong. According to the professor however, leadership doesn't end there in the scientific world. Not only do you have to be right, but "bonus points" are given if you are right on a question that has previously gone unsolved or unproven. In essence, while the initial "discovery" of gravity by Sir Isaac Newton circa 1670 made him one of the foremost leaders in science, proving gravity's existence today would probably gain you nothing more than a snarky remark from the scientific community[1]

Is leadership ultimately this cut and dry though? Have there not been countless examples of people throughout history who have "drank the Kool-Aid,[2]" so to speak, and followed a leader who was seemingly misguided? After several attempts to get a more complete and complex answer from the professor, and him repeating the same answer over and over, I realize that I needed a different approach.

[1] Thompson, Hobie, and Sarah Havern. "Gravity." Gravity. Stanford University, n.d. Web. 15 Apr. 2017.
[2] While somewhat common, this reference may escape some readers and is in reference to the 918 members of the Peoples Temple who died after drinking Flavor-Aid laced with cyanide at their leader's behest.

On my long walk back to my car, as I ponder my situation, I begin to consider a thought experiment. What happens if we de-personify leadership? In other words, what if we remove the idea of a leader from a human embodiment? Now at first this may seem like a rather difficult thing to do, because leadership in and of itself is a personified word. That is to say, you cannot have a leader without a person. Nevertheless, I began thinking of places that I could find examples of leadership in the physical world. As I pondered this, my mind gravitated towards the solar system. If I were to ask you, "What is the leader of the solar system?" how would you respond? If you're like 100% of the people I surveyed[3] you'd responded with the sun.

Why do we so rapidly arrive at the conclusion that the sun is the leader of the solar system? I think it is because we believe in a heliocentric model of the solar system and understand that for one reason or another all objects in the system, large or small, orbit around the sun due to some force. This may seem like a rather basic, trivial, and widely accepted notion to you, but it has not always been so. Galileo Galilei, the famed physicist and astronomer was "vehemently suspect of heresy" by a Catholic inquisition for "having held and believed a doctrine which is false and contrary to the divine and holy scripture: "that the sun is the centre of the world and does not move east to west, and the earth moves and is not the center of the world."[4] For this heinous crime, he "incurred all the censures and penalties imposed and promulgated by the sacred canons and all particular and general laws against such delinquents."[5] Galileo's book was banned, he was prohibited from teaching, forced to recite psalms every day, and placed on house arrest until the day he died…all for believing that the sun was the center of the universe not the earth.

[3] Survey group included 5 individuals of rather homogenous background, social standing, and belief.
[4] "Galileo's Sentencing." ESS 362 - HISTORY of ASTRONOMY - Gagné. Web Archive, n.d. Web. 01 Mar. 2017.
[5] Ibid

Why was this notion of heliocentricity of such import to the Catholic church? In my opinion it was largely because, in their view, as mentioned above, this view contradicted holy scripture, and thus called into question the natural order of things. This thought allowed for the thought that the earth (which was viewed as God's supreme creation since it is home to the human race) to be moved to a lesser or subjugated status moving around a ball of flaming gas. As a person of faith myself, I do not find anything seriously perturbing to my faith to admit that we are not the center of the universe. Perhaps, however, this is because I have found that there are deeper seeded patterns in this idea that give rise to perhaps more meaningful principles.

With the help of modern physics and astronomy, we now widely accept the idea of heliocentricity and our understanding of the solar system has grown even more.[6] We now understand that objects tend to group and order themselves according to mass, one around another.[7] The smallest objects in the solar system in orbit around slightly larger objects, and those objects fall into rotation around even more massive[8] objects.

What is even more interesting about this pattern of ordering according to mass, is that it is one that we find in most systems regardless of size. Electrons attach, detach and bond to the nucleus of an atom based on the atomic mass. Moons and debris rotate around planets, which in turn rotate around the sun. The sun in turn rotates around the center of the galaxy, which is a massive black hole—one of the densest objects known to man.[9]

[6] Interestingly enough, contrary to the Catholic Church's concern, there was no theological falling out that occurred once the earth was not recognized as the center of the universe, and this belief is held by most people regardless of faith or belief.
[7] Dunbar, Brian. "What Is Orbit?" NASA. NASA, 01 June 2015. Web. 18 Apr. 2017.
[8] This word being used in the literal sense referring to the mass of an object rather than in the colloquial sense in which we use it to describe physical size in a sense of volume.
[9] Morrow, Ashley. "Hubble's Journey to the Center of Our Galaxy." NASA. NASA, 29 Mar. 2016. Web. 18 Apr. 2017.

At the center of this interesting phenomenon is the relationship between mass and gravity. As the mass of an object increases, the force it is exerts on the objects around it increases. While the exact cause for this relationship is still being investigated by physicists around the world, it is generally attributed to the interaction between the mass of the object and the space time continuum.

The space time continuum, a theoretical idea developed by Albert Einstein to explain this relationship between mass and gravity is often referred to as the fabric of space-time to help us conceptualize this theory. Think back to your days in elementary school when you played with the massive parachute. At some point during the play time, your teacher almost inevitably instructed you all to pull the parachute tight, and then placed a ball on the chute and instructed you to complete an activity. While the activity is of little consequence in this story, what is important is the effect that the ball had on the chute. Despite the fact that you were pulling the chute as tightly as possible, as soon as the ball was placed on the chute it formed an indentation. Supposing that ball was small, the indentation would be small as well, even negligible, but what would happen if the teacher were to put a bowling ball in the center? That indentation would grow, and the entire parachute would slope inward towards it despite being held tight.

What would happen if we placed a tennis ball on the parachute while it still contains a bowling ball? Due to the indentation of the fabric, the tennis ball would roll towards the center of the chute until it settled near if not next to the bowling ball. In a similar way, regardless of how many balls we placed on the chute, they will roll towards the ball with the most mass, and they will generally group themselves relative to the mass of the balls.

With this in mind, the fabric of space-time is like the parachute we held as children, where the balls represent every object that has mass in this universe; everything as big as black holes and

massive stars, down to the tiniest ant. Every object in the universe that has mass creates an indentation on the fabric of space-time, and thus exerts an attractive, gravitational, force on the other objects around it.

While all objects with mass are attracted to one another (including mankind), that force is often not strong enough to have an effect on the world around us. This means that it is not until an object reaches a planetary type mass that we begin to see the effect on the world around us. For this reason, you don't see smaller humans orbiting larger humans…literally at least. However, we do see this pattern of orbits emerge in social settings.

Think for a moment about a person in your life that seems to be at the center of everything, that person from whom others take social cues. Perhaps that person is a parent, the "center" of the family, around whom all other members rotate. I have generally found this person to be the mother of the family, that divine feminine which, with unfathomable power, keeps the rest of the family in orbit and on course despite jobs, tee-ball practice, dance recitals, and personal projects and goals. Perhaps that person is a friend whom you and others respect deeply and are willing to alter your decisions based on their advice. Is it possible that besides the physical gravity which we exert on others, that each of us has a social "mass" and thus can exert a social "gravitational force" towards one another, pulling others into orbits around ourselves?

Just as smaller bodies orbit larger bodies that in turn orbit even larger bodies, we see this same pattern in our relationships. While the nuclear family may rotate around a parent, and a friend group may orbit around an individual, those individuals may rotate around another person entirely, taking their whole "system" with them. Perhaps this person is a grandparent or community leader, and even they rotate around someone else with even greater social "mass," perhaps a civic leader, a

religious leader, or a supreme power. As each of those centers moves, so do all the systems that orbit it. Thus, just as we see with both the fabric of space-time and the example of the parachute, as an object with a heavier mass moves, its effect ripples down through space-time affecting even the smallest object.

Now, Lest the physics professor with whom I consulted take offense at my metaphor, I need to acknowledge that this de-personified view of leadership associated with the metaphor of the universe has its limits. For example, while orbits in the universe are relatively ordinal and separated, human relationships are not. While it is possible for a human to be a part of various systems at various levels, each planet is only part of one set of systems. Human relationships are also much more dynamic than the universe. Our solar system has had eight planets, with a number of other bodies orbiting it for the last eon, and scientists do not anticipate that changing any time soon[10]. While the universe has stayed relatively consistent over time, human orbits can alter rapidly. With these constraints considered, I believe that the universe provides us an interesting framework with which we can conceptualize leadership by examining it in terms of social mass and gravity.

An intriguing example of a leader as someone who exhibits social mass and gravity is the leader quoted at the beginning of this section – Donald J Trump, President of the United States. All politics aside, during the recent election, Donald Trump exhibited a pull on many voters that surprising and unusual at times. Despite making statements on a regular basis that were considered by many to be racist, misogynist, and outright offensive, President Trump garnered media attention that far surpassed all other candidates, attracted voters, and ultimately won the election. Many attributed this to his willingness to speak his mind. Cindy Ross a Republican voter in Wyoming,

[10] This is not taking into account meddling scientist who take it upon themselves to demote certain planets, about which the author is NOT bitter.

speaking with the LA Times said: "He is upsetting the apple ... People are interested in voting because there might actually be a choice and a chance to make America great again."[11] Robert Beamish a Democrat from Arizona said "His activities seem to be focusing our attention on the corrupt establishment that has control of this country… Maybe the election of Donald might tip us over the edge and initiate some real reform."[12]

For one reason or another, Donald Trump was able to reach across the aisle and tap into something in both Democrats *and* Republicans, that brought them out of the woodwork, and motivated them to take action. In a very real way, President Trump drew people to him, and now he finds himself at the center of a very large system with an ability to exert galactic amounts of influence on those around him. In this way, leadership is using social mass and exerting social gravity to pull others into orbit around you.

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"When I find myself in times of trouble, mother Mary comes to me,
speaking words of wisdom, let it be.
And in my hour of darkness she is standing right in front of me,
speaking words of wisdom, let it be.

Let it be, let it be, let it be, let it be.
Whisper words of wisdom, let it be.

-A "Leader"

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[11] Shalby, Coleen. "How Is Donald Trump Affecting American Culture?" Los Angeles Times. Los Angeles Times, 28 Apr. 2016. Web. 19 Apr. 2017.
[12] Ibid

My journey to understand leadership takes us next to the office of a music education professor. Music has been a very important part of my life since I was a child. I chose to incorporate it into my search to define what a leader is because, like a trusted friend, I wanted to see what music had to say on the matter. Unlike other subjects however, I had no idea what it was going to tell me. In my mind, there are several ways that we could examine leadership in music. As a group activity, music is replete with leaders of all sorts. You have industry leaders who shape the type of music that is created, you have leaders within ensembles or groups such as the lead guitarist, the conductor, or even the concert master; and, just as we did with physics, you can look at leadership on a de-personified level seeking to find leadership principles in music independent of a person.

As I begin my interview with the music professor, it is immediately clear that leadership will not be as cut and dry with her as it was for her empirically oriented counterpart over in the physics department. Rather, I realized it is a much more complex issue. A large part of our discussion focused on leaders of ensembles. This would include the conductor and move down the line of command through the concert master, the section leaders, and all the way down to the stand leader. These leaders are critical to the successful performance of the piece because they bring all of the different elements of the ensemble into unity under the conductor. As a leader, the conductor is responsible to provide two things, a beat and a vision.

The beat is one of the most important things that a conductor can provide, because it is that one synchronized pulse that unites all members of the ensemble. This beat however is only a facet of music. A beat alone becomes rather monotonous and even sanity breaking as anyone who has listened to a metronome for any extended period can tell you. This is where vision comes into play.

The composer provides the framework to build a piece of music the same way a contractor builds a house. The job of implementation and use of the framework falls to the conductor, in a similar way that the decoration of the house falls to the homeowner. While the contractor could have imagined a dreary grey house with little furniture, a lively homeowner can quickly brighten things up by painting the walls, laying down new carpet and introducing new furnishings. In a similar way, while the composer may have had something in mind, the ultimate interpretation and *use* of work comes from the conductor.

For this vision to be effective however, it is paramount that the conductor communicates this vision to the members of the ensemble. As a leader, it is the conductors job to understand the role each member of the ensemble plays in the piece and in their vision as conductor, and then implement that vision accordingly. This requires a very high level of skill on the conductor's part as they must not only be able to interpret the music provided by the composer, but also know how to work with the wide variety of instruments under their direction and manipulate them to fit their vision. After all, an overly excited trumpet blaring during the soft serenade of a woodwind ballad would be quite disruptive to the piece, and, unless disruption is the vision the conductor has in mind, must be remedied. As we dive deeper into musical theory however, we continue to see these principles exhibited by the conductor exhibited in the music itself.

As the ensemble strikes the first note of a piece they are going to perform for us, what is it that we actually hear? While the note may sound in unison to our ears, we are actually hearing a note which is composed of some smaller elements that are called overtones. Sound is created through vibrations, whether from a string, a column of air, or the reverberations of a stretched animal skin. While the unit vibrates as a whole, it also can be broken down into a series of sub vibrations. Take,

for example, a string on a bass.[13] When the bassist plucks the string, the entire string vibrates creating the first layer of the note we hear. Let's say that note is a "C." From there, however, a number of sub-vibrations start happening. On the second level, the string vibrates in halves sounding another "C" but a little higher than the original. Those halves in-turn vibrate in half again sounding a "G" a fifth step above the "C." Vibrating in halves, and then halves again, the new note we encounter is an "E" above that "G", and vibrating in halves, and halves again, we find a new sounding a note (not used in western music) that falls somewhere in-between an "A" and a "B flat." [14] These five notes constitute something that is known throughout the world as the pentatonic scale and is a universal constant in music.[15] The pentatonic scale structure can be found in ALL music, regardless of the location, due to the fact that those are the order in which these notes appear in nature.[16]

If we continue subdividing the string long enough, eventually we will encounter all twelve notes[17] that are commonly used in western music and many others that are not used on a regular basis. When viewed from this perspective, each note ceases to be a single unique entity as we perceive it, but, the collaboration of many. In this way sound becomes something much more akin to light. In any given color of light, regardless of color, there are many base colors that make up the

[13] While the writer may be biased since the bass is his orchestral instrument of choice, the bass also serves a more utilitarian function in this writing since it is easier to separate overtones on it than on other instruments due to its lengthy strings and deep pitches.
[14] The Unanswered Question 1973 1 Musical Phonology Bernstein Norton. Perf. Lynard Berstein. Lynard Bernstein at Harvard. N.p., 9 Sept. 2014. Web.
[15] Ibid
[16] As an interesting side note, this elementary music education professor informed me that scientists believe that this order is also the natural way in which we perceive and learn music and sounds as a child. Think for a second about the child's taunt that we all repeated at some point in our childhood that went something like "nah nah, boo boo, you can't get me"…congratulations, you just sang a song based on the pentatonic scale, and one of the first examples of musical creation we see within children. (Bernstein)
[17] Represented by the 7 white keys, and 5 black keys on a piano.

one color seen.[18] For this reason, if you shine a beam of light through a prism, it fragments itself out into various colors and intensities. What actually determines the color of the light is the intensity in which each of those base colors present themselves in the light. A musical note behaves much in the same way, with each note being the theoretical combination of in infinite number of other notes all being mixed in a certain order and at a certain intensity which we recognize as "C."

This same principle of order and intensity has vast implications on leadership. Just as there are natural orders in which planets, sound, and light fall into a natural order to create a meaningful result, there are also natural orders that organizations must find in order to attain the desired result. Within a group, individuals are like one of those overtones. Each has a very important role to play, and without each individual contribution, the whole system would be altered, just like a white light without any red in it would look greenish. With this in mind however, it is important to remember than not all parts play the same role, nor do they do so with the same intensity. Just like how in music we can generally only perceive the first five or so overtones, there will be members of the team who will play more critical roles, and there will be others, who, like the infinite other overtones that follow, play a slightly less noticeable role; but an important one nonetheless.

It is critical that here we understand that if all the overtones were to play with equal intensity, all we would hear would be cacophonic noise. It is due to the order and intensity that they are given by nature that allows harmonies and melodies to be created. In a similar way, it is a leader's job to arrange all members of the group in an "order" and "intensity" that will create a harmonious and pleasing outcome. Rather than focusing on the popular belief that each member of the group must contribute equally, each team member should focus on completing the task they have been assigned

[18] David. "What Are the Rules to Using Color in Stage Lighting?" Learn Stage Lighting .com. Learn Stage Lighting, 21 Mar. 2017. Web. 18 Apr. 2017.

regardless of the perceived value of that task and understand that if all members of the group do so, the result will be sweet sweet music.

The leader quoted above, Paul McCartney of The Beatles, is a great example of this principle of getting the right people in the right order at the right intensity. He and his band demonstrated this principle two years into their career as a band when they decided to out Pete Best, and bring in Ringo Star as their new drummer. Originally, Best had been hired almost wholly on the fact that he was one of the only drummers willing to travel with The Beatles to Hamburg Germany during the early stages of their career.

When the Beatles auditioned for a record contract and the producer insisted that Best be sacked before they were signed due to his inability to keep a precise rhythm. The producer gave the band an ultimatum, and the band was faced with a difficult decision; they could either keep Best and lose the contract, or out Best and move forward with their careers. Ultimately, the band decided to oust Best in favor of taking the contract, a decision that would begin their path to stardom.

According to John Lennon, "[They] were always going to sack [Best] once they could find a decent drummer."[19] Speaking about the same incident, Paul McCartney said:

> It was a big issue at the time, how we 'dumped' Pete. And I do feel sorry for him, because of what he could have been on to; but as far as we were concerned, it was strictly a professional decision. If he wasn't up to the mark - *slightly* in our eyes, and *definitely* in the producer's eyes - then there was no choice. But it was still very difficult. It is one of the most difficult things we ever had to do.[20]

[19] The Beatles. The Beatles Anthology. San Francisco: Chronicle, 2002. Print.
[20] Ibid

While extremely difficult, this decision to take the contract over Best eventually proved to be an essential step in launching the band to the eventual stardom that they achieved.

Through helping members achieve the correct order and intensity as we have learned from the discipline of music, The Beatles, as soon-to-be leaders in music, would soon arrive at previously unattainable levels of music and fame. In this way, leadership is helping those around you and on your team achieve the correct order and intensity to propel the team to success.

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We have, at last, achieved our political emancipation. We pledge ourselves to liberate all our people from the continuing bondage of poverty, deprivation, suffering, gender and other discrimination.

We succeeded to take our last steps to freedom in conditions of relative peace. We commit ourselves to the construction of a complete, just and lasting peace.

-A "Leader"

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My final stop to try to understand leadership takes me to the small faculty office building on the edge of campus. Once, the box office for the old stadium, it now houses the offices of the Economics department. Economics, as a discipline, seeks to explain the reason that humans make the decisions they do. One of the most basic assumptions of economics is that people act logically in their own best interest. Thus, all human action, is a response to an incentive in one form or another. Lest you start feeling like a lab rat being trained to hit a button to receive gratification, an incentive as defined by economics is anything which could motivate someone to change their behavior. This could include pressure from others, the potential for pain, financial remuneration of some sort, or positioning themselves for an opportunity they perceive in the future. According to economists,

humans will *always* move towards the strongest incentive or the greatest payout. With this in mind, I feel quite certain that the field *must* have something to say about leadership.

As we begin our conversation, after some formalities, I turn the conversation to my quest to understand leadership. I share some of the insights I have gained from other areas and I turn the discussion to economics and leadership. To my surprise however, the professor quickly dismisses the idea of leadership; after all, we are ALL just pieces of a model, cogs in a machine that continuously moves forward. No leaders, no followers, just different actors playing different roles, but all to the same end of furthering our own self-interest.[21]

Perhaps seeing my concerned look, the professor stops for a moment and then explains that while all of this sounds very impersonal and off topic, there is actually a place where this all fits in. To see it however, we must examine one of a number of the models used by economists. We will use a common, simple model known as the prisoner's dilemma to show this. I will set the stage with a small story:

> Two prisoners rob a bank together and are taken into custody by the police. Despite the fact that they are in custody, both prisoners know that the police do not have any evidence against them and must rely on one or both of their confessions to obtain a conviction. If both prisoners stick to their alibi, both will walk free, BUT they would have to split the loot from the bank 50/50. If prisoner A rats on prisoner B, A walks free keeping all the loot, while B rots in jail. This also works the opposite way, if B rats on A. If both prisoners rat on each other however, they both lose the loot, and both spend some time in jail, but will get

[21] With views like this, it's no wonder people refer to economics as "the dismal science".

reduced sentences for their cooperation. Economists would represent this situation with a 2 x 2 table that would look something similar to the one below.[22]

	Prisoner A Sticks to Alibi	**Prisoner A Rats**
Prisoner B Sticks to Alibi	A 20,20	B 0,40
Prisoner B Rats	C 40,0	D* 10,10

As we can see from the diagram, both prisoners will be mutually best off if both decide to stick with their alibi and thus receive a payout of 20. Yet, we will almost NEVER see both prisoners stick to the alibi. Why? Because there is incentive to cheat. Looming in the back of their minds is the idea that if the partner does his job and sticks to their alibi, but he rats on his partner he will double his payout and thus earn a payout of 40. What inevitably happens is both prisoners end up ratting on

[22] Dixit, Avinash, and Barry Nalebuff. "Prisoners' Dilemma." The Concise Encyclopedia of Economics. Library of Economics and Liberty, n.d. Web. 18 Apr. 2017.

the other and we settle in box D known as the Pareto Efficient Outcome to the game, or the position where neither party has an incentive to cheat. [23]

In the context of a group setting, each of us is like the prisoners in the scenario. While we all may recognize that there is a more efficient outcome (Box A), we will all act according to our own personal agendas and all groups will, like the prisoners, end up settling in box D…that is unless someone intervenes.

As mentioned earlier, a leader's job is to get everyone to perform the correct task in the correct order despite their personal agendas. The way that the leader must do this is by offering or diminishing the pay outs to all members of the group such that rather than wanting to settle for the Pareto Efficient Solution, they can rise above their position, and achieve the solution to the game that is best for ALL players.

At the end of the day, the aforementioned idea can be summed up in this idea, that all actors in the model need to understand what economists call spillover effect. This is to say, we do not operate in a vacuum, our actions have effect and consequences on others not just ourselves. If each of us acted in a vacuum, we would all be able to work towards our own self-interest without the potential to harm one another, this would be leadership. In a world of interconnected systems as we observed in our study of physics however, all systems interact one with another and thus we must not only consider what is best for ourselves, but also what gives us the highest societal net benefit.

When both personal and societal benefit come into line, the decision is easy – we do it. It is in the precarious situation where those two ideals diverge however, where we find true leaders.

[23] Staff, Investopedia. "Pareto Efficiency." Investopedia. Investopedia, 18 Mar. 2016. Web. 18 Apr. 2017.

Leaders are those who make tough decisions between self-interest and societal interest; those who fight between two options and come to a compromise that rectifies the two…or perhaps doesn't and yields their own self-interest in favor of the best interest of the masses.

An effective example of this principle comes from the leader quoted above, Nelson Mandela, first black president of South Africa, and one of the main leaders of the apartheid movement. The conflict between the African National Congress (ANC) and The South African Government resemble, in large part, a form of the prisoner's dilemma known in economics as the "red, blue" game.[24] Instead of dealing with testimonies for, or against each other, the red, blue game deals with the actions, and retaliatory responses of parties. While the situations are slightly different, the mechanics are largely the same with both parties settling in Area "D" of the above table through actions such as the massacre of hundreds of protestors against the forced teaching of Afrikaans in public schools, and the recruitment of 14,000 militants by the ANC willing to die to see the end of Apartheid.[25]

It was only through the leadership of Nelson Mandela starting with his small concession to learn Afrikaans while in prison, that soon led to small amounts of reciprocation by the South African Government such as allowing prisoners (such as Mandela) to read the newspaper. These small affirmative acts soon began to grow with actions such as the release of Mandela from prison, and the beginning of formal negotiations that led eventually to the end of Apartheid.[26] Through small payouts given on either side, both parties were able to move out of area "D" and into the far more beneficial area "A" which was then made permanent through the reforming of the South

[24] Robb, Alice. "The Game Theory Behind Mandela's Negotiations to End Apartheid." New Republic. New Republic, 10 Dec. 2013. Web. 10 Apr. 2017.
[25] Ibid
[26] Ibid

African Government. In this way, leadership is the issuing of payouts such that parties arrive at a new, higher-level of performance rather than settling at the level of performance that results from them following their personal agendas.

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"[We] don't concede failure…we will never surrender. This crew is coming home…FAILURE IS NOT AN OPTION."

-A "Leader"

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As I have explored these various disciplines, I have found connections within each discipline to leadership. As I review each of the things I have learned from each discipline, and take a more holistic approach however, there is one common thread that I have observed within all of them, that in all instances the goal of leadership was to create something that was greater than the sum of its parts. In physics, mass and gravity create beautiful systems of atoms, planets, solar systems, and galaxies that move in harmony. In music, each individual over-tone combines to create notes which are used to create chords, harmonies, and symphonies that hold audiences' prisoner. In economics, the correct application of "payouts" by a leader allows groups to move from less efficient, through generally beneficial outcomes, and help them gravitate to the highest levels of efficiency and payout.

In each instance, without a "leader" the "group" fails to reach its full potential. Systems turn into massive rocks and balls of gas hurdling through space in a cataclysmic fashion. Music dissolves into senseless noise, and groups settle for less than ideal outcomes. In each instance, the leader

through one means or another inspired or enabled their group to attain a higher level of performance than they were individually capable of attaining.

The same principle of synergy found in nature applies to the individuals in groups as well. Each person enters a group with their own agenda, their own goals, and their own motivations. At the end of the day, if each works according to their own vision and purposes, then at best they will all achieve them, and at worst they will interfere with each other and cause mutual failure. With the efforts of a good leader however, those members are pulled into orbit around the leader, they are given a power and order in which to work, and they are incentivized to do so; and together they are able to attain things that they never would have been able to on their own.

A good leader understands that the entirety of human knowledge and skill is scattered throughout the brains of this planet's seven billion inhabitants. Individually, each of us only has a small part of that knowledge, but when joined collectively, a leader can theoretically have "all knowledge" and "all skill." Furthermore, when those individual parts come together and start working in a unified fashion, connections are formed that were previously unknown, innovation happens, and discoveries are made.

Gene Krantz, flight director for the Apollo 13 mission and the leader cited above, is a textbook example of this final, and ultimate ideal of leadership. After a devastating explosion aboard the moon-bound spacecraft, under the direction of Krantz, the mission control team brought the team back from the brink of death against incredible odds.[27] In reality, Krantz could not have done

[27] Useem, Michael. "Eugene Krantz Returns Apollo 13 to Earth." The Leadership Moment: Nine True Stories of Triumph and Disaster and Their Lessons for Us All. New York: Three Rivers, 2000. N. pag. Print.

it alone, rather it took 3 very large teams of specialists, men who had been tried and tested in every way possible, all under the direction of Krantz, to bring them home.

Their success and smooth operation as a team was no coincidence. Rather, it was due to various policies put into place when Krantz became flight director. While there were three independent teams, all teams were mirror images of each other (all of them had an engineer, a navigator, etc.), rather than give each person their own office per-tradition, he gave each position an office (i.e. all the navigators shared an office regardless of team) forcing cross-team collaboration and unity.[28] Couple this with inter-team competitions and recreation, and Krantz successfully created a team of teams, that functioned seamlessly even in times of immense pressure and stress. Due to the strength of his teams, and their trust in his leadership, Krantz's teams performed well beyond their individual capabilities and accomplished something everyone, besides Krantz and his team, thought was impossible. In this way, leadership is the successful orchestration of individuals to create things that have never been created, attain goals that have never been attained, and overcome barriers for ourselves and others that were previously thought to impassable, thus elevating ourselves, our teams and humanity to a level which was previously impossible for us to reach.

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I am twenty-two. I am sitting at a conference room table in a high-backed leather chair. There is a teleconference set in the middle of the table, I look around and see my two trusted advisors looking back at me. On the phone in front of us are forty-nine similar teams, one for each state. While I am the *only* Chairman responsible for the state of Utah, I must work with the other forty-nine teams to execute a strategy that will make our political candidate one of the most

[28] Ibid

powerful men in the world. I feel insignificant. We are talking about the budget, the statistics, and the results, real money, real people, real impact. Most of my counterparts on the phone have twice the experience I do, yet they look to me since I am the chair responsible for the campaign in a state that has been a bastion for our party since its founding. I must pull them into orbit around me, I must give them order and intensity to bring them into harmony, I must analyze and understand the entire situation, offering payouts such that personal agendas are left behind and we move towards a higher ground. Most of all however, I must inspire them to work together to achieve something more than they are individually capable of. I must forge new paths not only for me, but my children and their children. The future is now, we are changing the course of history.

I "lead."

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