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## Shadows in Time: A Study of Temporal Metaphysics through Hard Science Fiction and its Restrictions on the Past and Future

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# Shadows in Time: A Study of Temporal Metaphysics through Hard Science Fiction and its Restrictions on the Past and Future

## **Cover Page Footnote**

In Collaboration With Dr. Michael Rulison, Dr. Nicholas Maher, and Dr. Linda Taylor Dedicated To My father, who introduced me to the wonders of science fiction all those years ago and fed my hunger for it with his library of the classics My mother, who has read to me both as a child and an adult, teaching me to write stories that are a joy to read And to my other cherished family and friends, who patiently let me rail about the stupidity of paradoxes and who always inspire me to do better than what I believe myself capable of

## Reconciling Science Fiction and Temporal Metaphysics

## I

Two different kinds of science fiction have evolved over time. While the genre can be broken down into an almost infinite collection of subjects that span the entirety of the scientific world and beyond, each of these stories can be simplified and categorized as either Hard Science Fiction or Soft Science Fiction. Hard Science Fiction (or H.S.F.) is the original form of science fiction writing – it continues the tradition that was begun when the genre was first created as an educational device. The root of H.S.F. is still, above all, true knowledge. In order for a given work to earn the title, it must contain actual science within it, either as an exploration of some scientific idea that man is already aware of, or as an extension of the imagination based on the possibilities of the world around us. Some works of H.S.F. have been so imaginative that they led to discoveries that changed civilization: Arthur C. Clarke, also the inventor of the geostationary satellite, proposed in his work *The Fountains of Paradise* the concept of a space elevator, which would render rockets needed to break the earth's atmosphere obsolete. Of course, the space elevator still resides only in fiction today, but its possibilities, never before considered, became the defining feature of Clarke's scientific career. On the other hand, Soft Science Fiction (S.S.F.), also quaintly known as 'Space Opera,' requires no scientific proof to back up its claims and, as such, remains the more generally popular section of the genre. No prior knowledge of science is required for the S.S.F. writer, and he can fill his tales with physically improbable alien species, fiery explosions in the vacuum of space, and other scientifically bogus concepts that would never stand up in the court of H.S.F. writers. Famed author Larry Niven, creator of the *Ringworld* series, was actually called out by the science fiction community for his first book because of the improbability of the Ring-shaped planet itself. This challenge led him to write *Ringworld Engineers*, a book in which he explained exactly how the constructed world could exist, and his place among H.S.F. enthusiasts was restored.

While there are some who believe that science fiction can be dated back to as early as the epic of Gilgamesh, there are many, including myself, who place the genre's origins much closer to the 19<sup>th</sup> century. While the genre did not become defined as such until about that time, "the roots of science fiction are at least as old as modern science itself, germinating in the utopian romances of the sixteenth and seventeenth centuries, with offshoots in the Gothic novels of the eighteenth century and onward, eventually flourishing in the scientific romances and *voyages extraordinaires* of the nineteenth century."<sup>1</sup> The beginnings of science fiction as a

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<sup>1</sup> Colin Milburn. 560

genre were humble, with the express purpose of bringing complex, scientific ideas to the general public in a format that would be entertaining and understandable: “Jules Verne and H. G. Wells presumed that their adventurous stories would promote awareness of scientific knowledge and technological advancement. Hugo Gernsback, as well, understood science fiction as ‘a means of educating the public to the meaning of science, as well as providing the most delightful and stimulating entertainment.’”<sup>2</sup> The earliest use of the term ‘Science-Fiction’ appeared in 1851, only a little more than a decade after the term ‘scientist’ was coined.<sup>3</sup> William Wilson, the author in whose book the genre’s name first appeared, described science fiction as a body “in which the revealed truths of Science may be given interwoven with a pleasing story which may itself be poetical and true”<sup>4</sup>. Over a period of time, however, the original purpose of the genre began to be twisted; eventually, the need to entertain outweighed the need to educate, and ‘Pulp’ science fiction, the precursor of S.S.F., came into being. Around the 1930s, an era of superior science fiction writing was begun, which would be later called “The Golden Age of Science Fiction.”<sup>5</sup> During this time the precedent for H.S.F. returned with a vengeance, and some of the finest science fiction writers of all time made their mark on history, including Isaac Asimov, Arthur C. Clarke, Robert A. Heinlein (The Big Three), Poul Anderson, Ray Bradbury, Hal Clement, L. Sprague De Camp, L. Ron Hubbard, and many others. However, at the end of the Golden Age in the 1950s, the genre was still evenly split, and remained so until the writers of the era began to pass away. While there is a great deal of science fiction still being written, the once high precedent of H.S.F. has been partly lost in nostalgia; whether or not a second Golden Age will occur is not something that can be predicted, only hoped for.

Despite the recent fall from precedence that science has taken within its creative counterpart, “it is still commonly opined that science fiction functions as a kind of scientific activity, a thought experiment within a larger conversation about the cultural production of science and its implications.”<sup>6</sup> Though perhaps many scientists would like to deny it, the impact that fiction has on science can often be as defining as the impact that science has on fiction. This relationship between the two is most clearly seen in the development of technology. French author Jules Verne inspired the creation of two machines that would change modern history: the submarine and the helicopter. Igor Sikorsky, who was

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<sup>2</sup> Colin Milburn. 562

<sup>3</sup> H. Bruce Franklin. “Science Fiction: The Early History.”  
<http://www.andromeda.rutgers.edu/~hbf/sfhist.html>

<sup>4</sup> H. Bruce Franklin.

<sup>5</sup> “Isaac Asimov on the Golden Age of Science Fiction.” 1971 Interview.  
<http://www.youtube.com/watch?v=pySVYz4GfzE>

<sup>6</sup> Colin Milburn. 562

inspired by the science fiction writer's novel *Clipper of the Clouds*, "often quoted Jules Verne, saying 'Anything that one man can imagine, another man can make real.'" <sup>7</sup> Robert H. Goddard, inventor of the liquid-fueled rocket, took the first crucial steps towards the exploration of space after he was inspired by H.G. Wells' *War of the Worlds*; "as Goddard would recall later, the concept of interplanetary flight 'gripped my imagination tremendously.'" <sup>8</sup> Even S.S.F. can be credited with inspiring some of the modern era's most important technologies. The mobile phone was created by Martin Cooper who 'credited the 'Star Trek' communicator as his inspiration for the design.'" <sup>9</sup> It took the free realm of fiction for these devices to first be imagined, but the ingenuity of scientists and inventors to bring them to life. The symbiotic relationship between the two realms of thought is undeniable, as has been asserted by David R. Smith:

There is undeniably a link between science fact and the ideas that emerge in science fiction and fantasy. Science fiction authors are inspired by actual scientific and technological discoveries, but allow themselves the freedom to project the possible future course of these discoveries and their potential impact on society, perhaps remaining only weakly tethered to the facts. . . . Scientists, in turn, often derive inspiration from the imaginative possibilities that exist in fictional worlds, but are constrained to follow the laws of nature that apply in this world. <sup>10</sup>

However, the flow of inspiration from science to fiction and vice versa does not have equal limitations; scientists are constricted by the physical laws of the universe and the availability of resources. Conversely, science fiction writers can easily be tempted by an overabundance of freedom. The worlds they create, by their very nature, do not have to conform to any restrictions if the writer so chooses to ignore them. Even H.G. Wells, regarding his famous novel *The Time Machine*, "clearly understood that he wasn't writing science at all but rather was writing about the human condition, both past and present, and he was perfectly willing to make an 'error' for the sake of a story." <sup>11</sup> His 'error,' as Professor Nahin describes it, has to do with Wells' description of the machine itself and, therefore, his treatment of Temporal Metaphysics, or the study of the physics of Time and Space. Much like the stories of this thesis, Wells' *Time Machine* sacrifices certain physical limitations and logical consequences in order to further

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<sup>7</sup> Mark Strauss. "Ten Inventions Inspired by Science Fiction"

<sup>8</sup> Mark Strauss. "Ten Inventions Inspired by Science Fiction"

<sup>9</sup> Mark Strauss. "Ten Inventions Inspired by Science Fiction"

<sup>10</sup> Colin Milburn. 567

<sup>11</sup> Paul J. Nahin. 146

the novel (as will be shown further along in this thesis). It is the unfortunate truth that, on occasion, fiction and science cannot be reconciled together perfectly, and, because the nature of Temporal Metaphysics is based on theory, logic, and complex mathematics rather than testable ideas, certain scientific concessions have to be made in the short stories of this thesis to allow for the plot to advance; therefore, though it is the goal for the stories to remain true to H.S.F. as much as possible, in some places the science will stray into the realm of S.S.F. as a necessity.

## II

One of the difficult problems preventing the reconciliation of H.S.F. with Temporal Metaphysics is the fact that ‘time’ is still an entity that scientists have not yet fully understood. Some debate that time is just a human construct to define change. Some counter that it is another dimension or a substance called ‘space-time’. Part of the confusion exists in the disconnect between what we conceive of as ‘time’ and what science tells us is ‘time.’ Much like gravity, the effects of ‘time’ can be seen as an invisible force on the surrounding world. The seasons change just as predictably as a rock that falls to the ground when dropped. People age and die with the same surety as the forces that keep them rooted to the earth. But these are only the effects of time, and not time itself, that we are seeing. Because much of what we understand about time is based on its effects,

it feels as though time flows, in the sense that the present is constantly updating itself. We have a deep intuition that the future is open until it becomes present and that the past is fixed. As time flows, this structure of fixed past, immediate present and open future gets carried forward in time. This structure is built into our language, thought and behavior. How we live our lives hangs on it. Yet as natural as this way of thinking is, you will not find it reflected in science. The equations of physics do not tell us which events are occurring right now—they are like a map without the ‘you are here’ symbol. The present moment does not exist in them, and therefore neither does the flow of time.<sup>12</sup>

Time has before been poetically described as both a river and an ocean, yet the metaphors are equally flawed. The one imagines that time flows in a forward direction, but does not specify at what speed or consistency of speed it does so. The other removes even these restrictions and leaves the universe drifting in an

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<sup>12</sup> Craig Callender. 1

indefinable mass of time-stuff. Though beautifully put, the imagery fails to bring us any closer to understanding the nature of what time actually is. Perhaps it is a concept that cannot even be understood on the same level as the rest of the world; “although time may not exist at a fundamental level, it may arise at higher levels—just as a table feels solid even though it is a swarm of particles composed mostly of empty space.”<sup>13</sup> In order to reach these higher levels, it is necessary to start at the beginning of the logical process by determining the most basic features of time. First of all, what *is* time? Put simply, “time is a relational structure of processes or events.”<sup>14</sup> We understand time by one of its most basic features, which is the fact that it orders occurrences in the universe. According to Isaac Newton’s laws of motion, “no matter when or where an event occurs, classical physics assumes that you can objectively say whether it happens before, after or simultaneously with any other event in the universe. Time therefore provides a complete ordering of all the events in the world.”<sup>15</sup> The fact that World War One preceded World War Two is not a matter of perception but of physical fact. “Furthermore, time must be continuous so that we can define velocity and acceleration”<sup>16</sup>; no matter how long the wait at the DMV may *seem*, time has not slowed down, just as time does not speed up in order to thwart the more entertaining moments in life. These two properties – order and continuity – are further enhanced by a third, which states that “classical time must also have a notion of duration—what physicists call a metric—so that we can tell how far apart in time events are from one another.”<sup>17</sup> From this concept stems the breaking up of time into intervals by which we ‘measure’ time: hours, minutes, seconds, etc.

None of these properties of time, however, gives us an idea of *what it is*, whether it is an energy that drives the universe onwards or a form of matter in which the universe resides, or some other concept that is beyond our imaginations. This ignorance is constantly being challenged by scientists determined to figure out the mystery. For centuries, Isaac Newton’s theories on time were the scientific standard. He “proposed that the world comes equipped with a master clock. The clock uniquely and objectively carves the world up into instants of time.”<sup>18</sup> This theory provides time with a continuity that is not dependent upon space – in other words, an instant in one area of the world is the same instant in another area of the world, or in another area of the universe. “Newton additionally felt that time flows and that this flow gives us an arrow telling us which direction is the

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<sup>13</sup> Craig Callender. 1

<sup>14</sup> V.F. Lenzen. 184

<sup>15</sup> Craig Callender. 2

<sup>16</sup> Craig Callender. 2

<sup>17</sup> Craig Callender. 2

<sup>18</sup> Craig Callender. 2

future”<sup>19</sup>; this ‘flow’ would later be challenged as an insufficient concept (much like the river of time metaphor) by scientists such as “Austrian physicist Ludwig Boltzmann, who reasoned that, because Newton's laws work equally well going forward or backward in time, time has no built-in arrow.”<sup>20</sup> In turn, Boltzmann’s reasoning, though it seems sound, has been contradicted by the second law of thermodynamics which, through entropy, contests that the universe’s natural tendencies towards chaos serve as an ‘arrow of time’ determining the difference between past and future – a concept that will be discussed in more detail in the third essay of this thesis, “Time Travelers: Limited by the Nature of Past and Future.” Newton’s idea of the master clock, and much of his theories on time, would be replaced in the 20<sup>th</sup> century by physicist Albert “Einstein [who] mounted the next assault by doing away with the idea of absolute simultaneity. According to his special theory of relativity, what events are happening at the same time depends on how fast you are going.”<sup>21</sup> Einstein’s relativity theories are the reason that, in many science fiction stories today, characters who travel great distances in space leave their loved ones behind in age and decay while they continue to stay young, for the speeds at which they are travelling are so vastly different that time passes at different rates for each. These stories are further aided by “Einstein's general theory of relativity, which extends special relativity to situations where the force of gravity operates. Gravity distorts time, so that a second's passage here may not mean the same thing as a second's passage there.”<sup>22</sup> Einstein also tackled the question of what *time* is by reconciling both time and space into one entity: his theory “achieved the union of space and time in four-dimensional space-time,”<sup>23</sup> a concept further developed by scientist Hermann Minkowski, the creator of “the modern view of reality, that the past and present and future are joined together into...*spacetime*.”<sup>24</sup> Spacetime, though it is technically an answer to the ‘what is it?’ question, is still tricky to define. To put it simply, spacetime is a combination of events and their locations, invariably connecting motion and time. Without moving objects (people, planets, clouds, everything that makes up the universe), there would be no time, and without time, there would be no moving objects: “for Newton, space and time are the background in which physical processes in the world evolve. For Minkowski, spacetime *is* the world.”<sup>25</sup>

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<sup>19</sup> Craig Callender. 2

<sup>20</sup> Craig Callender. 2

<sup>21</sup> Craig Callender. 2

<sup>22</sup> Craig Callender. 3

<sup>23</sup> V.F. Lenzen. 184

<sup>24</sup> Paul J. Nahin. 148

<sup>25</sup> Paul J. Nahin. 152



### III

Having established these concepts of time on a very basic level, it then becomes necessary to reconcile the science with the fiction, for in order to write H.S.F., the author must adhere to the scientific laws and principles that define the area of study in addition to all the physical laws that govern the universe as we know of it today. Unfortunately, because the nature of Temporal Metaphysics is based on theory, logic, and extremely complex mathematics rather than testable ideas, certain concessions have to be made in the short stories of this thesis to allow for the plot to advance. Many questions that cannot currently be answered with a definitive ‘yes’ or ‘no’ must be decided upon at the writer’s discretion; at this point it almost becomes an opinion-based venture, for the writer must gather the current scientific theories and weigh among them which one contains the most logical argument or is the most appropriate for the given story. One of the questions that must be answered is, “Is time-travel possible? Like most intriguing problems that lie within the shared locus of physics, metaphysics and logic, this question admits of many interpretations, each of which engenders a different line of research.”<sup>26</sup> The unfortunate reality is that it is impossible to know whether or not time travel will one day *exist*, despite our current understanding of spacetime and the fact that relativity states that time travel is physically possible, due to the fact that time travel is a technological nightmare. If the writer assumes that time travel can exist, then the “original question arrives at last on the drawing boards of the engineers, having passed successively through the precincts of the theoretical physicists, the mathematicians, and the astronomers.”<sup>27</sup> Designing a physically probably time machine for the purposes of a story is, however, at the moment impossible; even the most scientifically-accurate time machine ever conceived (that is, according to the *math* it would allow for time travel) is impossible to build and is restricted to only a limited amount of backwards time travel (see the Tipler Cylinder in “Navigating Space and Time”). However, there are some fundamental requirements that time machines would have to have in order to function properly – these can be used by the writer to stick as close to H.S.F. as possible. One of them is that, because of the nature of spacetime, a time machine would have to move through both space and time at once, rather than stay stationary on the face of the earth as in H.G. Wells’ *Time Machine*:

Since time is kind of like space (the four dimensions go hand in hand), a working time machine would zoom off like a rocket rather than disappearing in a puff of smoke. Einstein described our universe in four dimensions: the three dimensions of space and one

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<sup>26</sup> Tim Maudlin. 303

<sup>27</sup> Tim Maudlin. 303

of time. So traveling back in time is nothing more or less than the fourth-dimensional version of walking in a circle. All you would have to do is use an extremely strong gravitational field, like that of a black hole, to bend space-time. From this point of view, time travel seems quite difficult but not obviously impossible.<sup>28</sup>

Ultimately, technology is what is truly keeping time travel at bay. If the machinery that could accomplish such a bending of space-time could be invented tomorrow, then all of the current debates and squabbles that appear in Temporal Metaphysics, such as the nature of time, the differences between the past and the future, paradox, and others, would be solved by the simple fact that a scientist could use the machine to answer all of these questions. Unfortunately, as said before, Temporal Metaphysics is not yet a testable science, and can only be discussed theoretically. Therefore “it is what physicists and mathematicians think that is important because, after all, if a time machine is ever built, it will be as a result of new understandings at a profoundly deeper level of mathematical physics than we have today.”<sup>29</sup>

Of course, instead of imagining a future machine that runs the risk of breaking the laws of physics, the writer of H.S.F. could always stretch the laws just slightly enough to create a machine that will travel through time. In the end, it is fiction that is being written, not scientific dissertation. The ‘simplest’ concept to travelling through time is to use a machine that moves through space so quickly (close to the speed of light) that the personal time of the machine and those within it moves slower than the general time of whatever planet the travelers are measuring themselves by to the degree of hundreds of thousands of years, maybe even millennia. Yet moving that quickly is a distinct issue when it comes to physics; the closer an object gets to the speed of light, the more it is compressed into extreme densities. This would, of course, be a problem for human travelers, who would be destroyed in the attempt. And finally, even if time travel is possible, and if a machine can be devised that will not crush its occupants, then what do we do? Travel forward, or back? Travelling forward is no problem at all, theoretically; but travelling back introduces a whole new issue of logic that bothers many even today. Paradox, and all of its warts, has been argued across the field from many points of view, and will be discussed further in “Time Travelers.” None of these debates can be answered one way or another because they are all based on logic. Yet these stories *must* take a side, especially when it comes to theories that contradict each other. The evidence of many different speculations will be discussed within the essays of this thesis, while the stories will express the ideas that the writer has found to be the most plausible.

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<sup>28</sup> Sean Carroll. 1

<sup>29</sup> Paul J. Nahin. 80

## Navigating Space and Time: The Combination of Machinery and Relativity

### I

Thankfully, the most basic question of time travel – is it possible according to the laws of physics? – has been answered by Einstein’s theories of relativity, and therefore is not a concept that the science fiction writer has to battle against in order to remain scientifically true in his stories:

Einstein’s special theory allows of time travel into the future. To return, however, to travel into the past, had been thought impossible. Yet since 1949 it has been known that the general theory, which so far has passed every experimental test it has been subjected to, does allow time travel to the past under certain conditions.<sup>30</sup>

Travelling into the future is easy – every person does so from the time they are born until the time they die, and after that their remains continue on without their consciousness. It is a natural process of existence that we have little to no control over. Travelling into the past, however, is a disruption of the ‘natural order,’ an attempt to gain control of the process of moving through time, and such a radical alteration of physical order comes with consequences and complications; as a result, backwards time travel, has been a much more heated topic of discussion (which shall be seen in the next essay’s section on paradox.)

First of all, what are Einstein’s theories of relativity? “Einstein’s General Theory of Relativity (GTR)...[is] a theory that accounts for the motions of large bodies, their apparent subjection to gravitational and inertial forces, and the relations of these phenomena to measures of time and distance”<sup>31</sup> – in other words, the GTR “extends special relativity to situations where the force of gravity operates”<sup>32</sup> and is used to study the effects gravity has on objects like planets, stars, galaxies, and even its effects on space-time. The Special Theory of Relativity (STR) is the study of these same objects in conditions that are not affected by gravity. But how can gravity have an effect on space-time? One of the most interesting aspects of the GTR “describes space-time in a way that allows it to exist and have determinate properties not reducible to the properties and relations of the material contents of space-time.”<sup>33</sup> Space-time is, therefore, real

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<sup>30</sup> Paul J. Nahin. 18

<sup>31</sup> Carl Hofer. 5

<sup>32</sup> Craig Callender. 3

<sup>33</sup> Carl Hofer. 5

rather than conceptual, distinct from its contents, like a substance in which other materials and objects exist. The belief that space-time has physical reality is called “‘substantivalism’... To be slightly more precise, a modern-day substantivalist thinks that space-time is a kind of thing which can, in consistency with the laws of nature, exist independently of material things (ordinary matter, light, and so on).”<sup>34</sup> If space-time is a physical entity, then, naturally gravity would be able to affect it in some way. One of these results of gravity on space-time is that “gravity distorts time, so that a second's passage here may not mean the same thing as a second's passage there.”<sup>35</sup> In summary, time is directly linked to physical space, and their union, space-time, is also a physical entity that is affected by gravity. For any potential time traveler, this knowledge is an essential part of creating the time machine, for the machine will have to be able to handle space-time as a whole and the gravitational forces that rule it.

Since time travel is possible according to Einstein's theories of relativity, the largest barrier now separating humanity from ever traveling through time is technology. Constructing a time machine is currently impossible. Many theoretical machines have been designed by interested scientists, and, *on paper*, they have the desired effect of time travel – they can be proved mathematically as functional, but they all share a common feature in that they must, for the moment, remain conceptual due to several features of their design that are out of technological reach. However, it is an interesting fact that some very simple time machines already exist, evolutions of technology that was invented at the beginning of the 17<sup>th</sup> century.

In 1609 Galileo began developing his telescope, a more powerful version than the ones that had already been designed, by concentrating on and experimenting with the properties of lenses. His work would lead him to be the first man to observe the mountains and craters on the moon as well as two satellites of Jupiter.<sup>36</sup> Since then the telescope has grown to be one of the most fascinating pieces of equipment used to study space and the incredible variety contained within its vast reaches. The strongest telescopes searching the contents of our universe can capture images that are thousands of light-years away. But what is a light-year? In measurements that are easily understandable, a light-year is approximately six trillion miles, or how far light can travel through a vacuum in one year. That means that when a telescope captures a picture of an object only *one* light-year away, the picture is already a year out of date. If an object is thousands of light-years away, then the telescope is viewing that object not as it currently is, but as it appeared thousands of years ago. The further out into space we look, the further back in time we ‘travel.’ In this way, powerful telescopes

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<sup>34</sup> Carl Hofer. 5

<sup>35</sup> Craig Callender. 3

<sup>36</sup> Michael Fowler. “Galileo and the Telescope”

could be considered as the first time-machines allowing for backwards time travel. Though the scientist who observes the images captured by a telescope cannot himself travel back in time, he is able to see the universe as it was all those millennia ago. Conversely, however, that means that scientists are *unable* to see the universe as it currently is in most places.

This problem is what inspired the reason for the time travel in the stories of this thesis. It becomes the scientists' goal to travel into the far distances of space to observe certain celestial formations as they are in 'current time.' In a normal space ship, the journey would outlast the lives of the scientists both in the ship and of hundreds of generations of people on the earth. To combat the time, a time machine is invented so that while the scientists are traveling 'forward' through space, they are simultaneously traveling 'backwards' in time.

Such a conceptual time machine is all science fiction, of course, as is any plausible time machine that can fit into a story. All of the time machines that could actually work are so complex and mathematical in nature that it would be nigh-impossible to explain them on a level that most readers could enjoy. The difficulties in crafting time machines have led many science fiction writers to skip over the details and explain them away with plot devices. One example is "when a young boy asks his physicist-uncle how his time machine works, he is told, 'Come back when you know tensor calculus and I'll explain to you about n-dimensional forces and the warping of world lines.'"<sup>37</sup> Sometimes the time machines are accidental results of experimentation, allowing the writer to gloss over the workings of the machines in favor of the story. The contortions that authors must go through to avoid inventing a machine so unbelievable that their work is no longer science fiction at all can be ruthless. But there are a few, necessary aspects of time machines that every writer can adhere to, whether or not they discuss in detail how it was made.

First of all, a time machine must move through space *and* time simultaneously. One very practical reason for this rule is that the universe is in motion – if a scientist created a stable time machine, such as H. G. Wells did, and then traveled thousands of years into the future, he would find himself stranded somewhere in the middle of space and not still planted firmly on the earth! We have to take into account the movement of our surroundings. If we plan to travel to 1963, then we must ask "Where is 1963?...Quite far away, as it works out. Since 1963, the Earth's been going round the Sun, while the Sun itself is revolving around the hub of the galaxy, and so on. Add that up and you find 1963 is pretty distant."<sup>38</sup> In order to catch up with the moving galaxy, "a real time machine must move in space...as well as in time. All the theoretical models for time travel...(Tipler cylinders, black holes, Godel rockets, cosmic strings,

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<sup>37</sup> Paul J. Nahin. 21

<sup>38</sup> Paul J. Nahin. 24

spacetime wormholes, and superluminal spacetime warp drives[, etc.]) require spatial displacement.”<sup>39</sup> The movement through space itself is also a problem, however, especially since the machine has to be moving at high speeds to make time travel possible (high enough speeds to warp space-time). Space is incredibly dangerous: “To zip through space (which is not a perfect vacuum) at such speeds would result in a very high rate of collisions with stray hydrogen atoms (about one each cubic centimeter). The result of these energetic interactions would be the intense irradiation of the entire ship with a lethal dose of gamma rays long before the trip had even really begun,”<sup>40</sup> thus killing all of the time travelers within. A working time machine would also have to take into account a way to protect the travelers from such a deadly environment. Thirdly, the science fiction writer cannot ignore mathematics when crafting his time machine. There are limitations on speed, as already discussed regarding the consequences of moving close to the speed of light, related to survivable forces. The closer to the speed of light a time traveler gets, the more compressed they become – an condition that quickly becomes dangerous for any human being. Paul J. Nahin has created an extremely handy pair of charts that many science fiction writers would find very useful when plotting out their time traveler’s journeys, for he specifies the distances that could be traveled and how long it would take to travel them under certain, comfortable pressures.

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<sup>39</sup> Paul J. Nahin. 23

<sup>40</sup> Paul J. Nahin. 472

**Table TN6.1.** Time travel to the future on a rocket ship accelerating at one Earth gravity.

EXPERIENCED ACCELERATION = ONE GEE			
$4T'$ (rocket years)	$4T$ (Earth years)	Maximum Distance (light-years)	Maximum Speed ( $\times$ Light Speed)
1	1.01	0.065	0.252
2	2.09	0.26	0.475
5	6.5	1.85	0.86
7	11.5	4.1	0.95
10	25.5	10.9	0.9886
20	339	167	0.99993
30	4,478	2,237	0.9999996
40	59,223	29,610	

**Table 6.2.** Time travel to the future on a rocket ship accelerating at two Earth gravities.

EXPERIENCED ACCELERATION = TWO GEES			
$4T'$ (rocket years)	$4T$ (Earth years)	Maximum Distance (light-years)	Maximum Speed ( $\times$ Light Speed)
1	1.04	0.13	0.475
2	2.4	0.56	0.775
5	12.7	5.47	0.9886
7	35.9	17	0.9985
10	169.3	83.7	0.99993
20	29,612	14,805	
30	5,180,000	2,589,279	
40	906 million (!)	453 million (!)	

Of course, these charts only provide information for writers who are interested in *forward* time travel. For science fiction writers who are interested in *backwards* time travel, the most accurate time machine that has ever been designed would be what is called the Tipler Cylinder. Frank Tipler, responsible for the concept of this time machine, noted that “general relativity suggests that if we construct a sufficiently large rotating cylinder, we create a time machine.”<sup>41</sup> The actual mathematics make his machine a bit more complicated than this brief description implies, of course:

what Tipler had actually done was to show that if one had an *infinitely* long, very dense cylinder rotating with a surface speed of at least half the speed of light (the rotation speed is such that the centrifugal forces are balanced by gravitational attraction), then this allowed the formation of closed timelike lines connecting events in spacetime. This means that by moving around the surface of such a fantastic cylinder, one could travel through time into the past—but not to earlier than the time of the creation of the cylinder. Tipler's cylinder would also enable a time traveler to return to her original time, to go ‘back to the future.’ ...No one, in fact, disputes this. It is true. On paper.<sup>42</sup>

The fact that the Tipler Cylinder can, at the moment, only exist on paper is a problem that can be fixed somewhat in science fiction if not in reality. But some of the problems are things that cannot be swept under the carpet of creative devices, such as the problem of an *infinite* cylinder. In answer to the issue of the infinite cylinder requirement, some scientists have suggested that “‘in some respects an infinite cylinder may be a model for a long finite one, and the possibility cannot be dismissed that a time machine might be associated with a long, but finite rotating system.’ In Gribbin (1983), for example, we find the estimate that a 10-to-1 ratio of cylinder length to radius may be enough for Tipler's cylinder to be ‘infinite.’”<sup>43</sup> Even this ratio, reasonable as it may sound, creates difficulties when the rotation is applied. In order for the cylinder to not be crushed by under the extreme speeds, it would need to be sufficiently large and ridiculously dense:

We are not talking about cylinders the diameter of a pencil or even of a large water pipe. Recall that for a given surface speed, the larger the diameter, the less the centrifugal acceleration at the

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<sup>41</sup> Paul J. Nahin. 92

<sup>42</sup> Paul J. Nahin. 93

<sup>43</sup> Paul J. Nahin. 93



surface. It is easy to calculate that even a huge cylinder 10 kilometers in radius—and so by Gribbin’s estimate at least 100 kilometers in length—would have, with a surface speed of half the speed of light, a surface acceleration *two hundred billion* times the acceleration of Earth’s surface gravity. No known form of ordinary matter could spin that fast and not explosively disintegrate. But then, Tipler cylinders would not be ordinary in any sense of the word. Tipler has estimated that the required density for a time machine cylinder would be 40 to 80 orders of magnitude above that of nuclear matter. Made from such superdense stuff, a finite cylinder would typically be as massive as the Sun but many trillions of times smaller. Showing no lack of imagination, Tipler has himself suggested (1977) the possibility of speeding up the rotation of an existing star as an alternative approach to that of actually trying to build a cylinder. Of course, this would be a project for a far-future society with a very advanced technology.<sup>44</sup>

Matter dense enough to satisfy all of the requirement for a functioning Tipler Cylinder has not been discovered or crafted – it is a substance that a science fiction writer could feasibly invent, however, which makes the Tipler Cylinder a good starting point for a possible conceptual time machine.

## II

So what exactly happens when a person travels in a time machine? It is impossible to say for sure what the experience would be like during the journey, but we can speculate that, if the time travelers were attempting to visit some temporally distant society, they would experience something similar to getting in a plane, travelling for a fixed period of time, and emerging in a new and foreign place. It would be clear to the time traveler that both space and time had been travelled through, for they could compare what they know of the world that they had come from to what they find after their journey: there would be signs of societal change. But notice that even this simple scenario has two time-lines. The time travelers are moving through time (say, from 2013 to 2498) *and* observing their own timeline at its ‘normal’ rate (it takes them three weeks to do so).

This concept, which helps to contradict Newton’s universal clock theory, splits time into two categories – proper time (or personal time) and general time. Proper time is the passage of time that every individual observes independent of their location or how fast they are moving. General time is both location and

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<sup>44</sup> Paul J. Nahin. 93-4

speed dependent – for example, all people on earth share general time, because on earth they are travelling at the same rate (roughly the speed at which the earth travels through space). Two people standing next to each other in Times Square share general time. If one of those people gets into a space ship and travels far out into space at high speeds, however, their general time is no longer in sync with the person in Times Square. If the space ship moves through space at such an accelerated rate that time becomes distorted, then the person's journey could take three months according to their observance of proper time, but if he measures his passage by the general time of earth, he could have been gone for fifty years, or a hundred years. For example,

by traveling in a rocket ship fast enough (but never...faster than the speed of light) and far enough, one could leave Earth, loop out on a vast journey perhaps halfway across the universe, and then return hundreds, thousands, even millions of years in the future. You could do this, in fact, with the apparent passage of 'personal time' (as measured by your wrist watch or the beating of your heart) as brief as you'd like.<sup>45</sup>

This technique is quite popular in science fiction. In Orson Scott Card's acclaimed novel *Speaker for the Dead*, the main character Ender travels to another world with his sister. While they travel together, they share the same proper and general time while also leaving the era of Earth they know far behind in antiquity. But later on, Ender leaves his sister behind to go to a different world, and general time is no longer the same for them. For Ender, his journey takes only a few months, but by the time he reaches his destination and is able to contact his sister again, she has become old. His brief journey has taken his sister decades. The disconnect between proper time and general time can be seen represented in Nahin's mathematical tables represented on page 18. For example, to travel for forty years in space accelerating at only one earth gee would pass by almost sixty thousand years on earth.

The time difference is only one of the many consequences of traveling through time. The direction that the traveler chooses, to the past or to the future, determines which consequences will be dealt with. According to the logic of each, however, no matter which direction the time traveler chooses he faces isolation: losing all of his friends and family in old age by traveling into the future, or, by traveling into the past, losing his own involvement in the world.

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<sup>45</sup> Paul J. Nahin. 25

## Time Travelers: Limited by the Nature of Past and Future

## I

The differences between traveling forwards into the future and back into the past, and the varying consequences of either, make up a large portion of the current debate on the nature of time and time travel. The number of theories available on these subjects makes writing accurate science fiction very difficult to do, for none are so logically thorough and physically provable that they can be presented as the only consideration. Theories on time travel have many ingredients, some of which are based on the scientist's personal beliefs and some of which are based on physical reality; his views on the difference between the past and the future, his understanding of logic combined with physics, and many more all affect how he will view the possibility, or impossibility, of time travel in either direction.

In order to craft one's own view of time travel, the inquiring mind must first consider the differences between the past, present, and future. Are they separate pieces of a whole, or are they simply figures of speech used for human categorization, like the measurement of the hour? Can they affect each other? How does the process of change between the three occur? Time is difficult to understand physically because it has been conceptualized by vocabulary for millennia; an important question to start with is whether or not time has "spatial character...When a succession of events is thought of, the events are ranged in spatial order. We speak of time as long or short; we speak of the distant past and the near future, or of the receding past and the coming years; we 'look before and after.'"<sup>46</sup> But is the differentiation between 'now' and 'then' physical truth, or merely the human mind attempting to understand observable change and predictable outcomes? Are the future and the past *real* in the same way that the present is *real*? Naturally, there are two different ways to answer this question: "*eternalism* is the doctrine that the past, present and future are all equally real, and there is no metaphysical difference between them, just an indexical one," whereas "*presentism* [is] the doctrine that only presently existing things and events exist."<sup>47</sup> The former makes time travel easy – we can travel to the future or the past because it is a physical reality, just like traveling from Paris to San Francisco. The latter rules time travel out entirely; we cannot travel into the past because it is a present that has ceased to exist, and we cannot travel into the future because it is a present that has not yet become real. With the doctrine of presentism under his belt, a time traveler would have better hope of finding the land of Narnia than of finding the year 3146. What the two theories share in common is the idea that the

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<sup>46</sup> Walter Smith. 372

<sup>47</sup> Bradely Monton. 56

present, at least, is real. This factor is an easy thing for anyone to believe, for present “reality resolves itself into tangibility or solidity, [and therefore] the objects perceived around us are thought of as tangible or solid. Even the ideas of the mind, when thought of as present, have tangibility associated with them.”<sup>48</sup> But humans are incapable of perceiving everything at once; our understanding, recognition, and perception of the world at large is limited, even within the present moment. It is not surprising then that “when objects or ideas are referred to the past they appear as unreal; they are unsolid, intangible”<sup>49</sup> because we cannot actively perceive them. ‘Ahah!’ cries the devil’s advocate – with the invention of the camera we can capture these past moments and make them physically perceptible, thereby defeating the theory that the past is not real because there is physical and observable evidence that it is. “It is true, the image of the past may come before the mind with the familiar sense of reality”<sup>50</sup> but acknowledging that something once existed does not assure that it is still in existence. The portrait of Teddy Roosevelt proves that he once lived, but does not imply that he is still living, or that the time in which he lived is still a physical reality that has been overlapped by the more tangible ‘now.’ In the same sense, the future is also unreal – though, ironically, even though we can acknowledge that we are moving towards it, we must accept that it is in a way even less real than the past because we have no way of observing it. There is no camera that can capture an image of the future. It is this problem of limited perception linked to our understanding of reality that gives presentism its appeal.

Eternalism is not, however, without hope. Presentism asserts that reality grows and decays – a dead past gives way to the real present that will develop into the future, and everything shifts perpetually on that line. But this very theory makes time directionless, or, rather, it attributes both forward and backward motion to the present. The present is at the same time decaying into the past and growing into the future. However, it is accurate to say that time *does* have direction, and that direction is described as the thermodynamic arrow of time: “the arrow of time is simply the distinction between the past and the future. We can turn an egg into an omelet, but not an omelet into an egg; we remember yesterday, but not tomorrow; we are born, grow older, and die, never the reverse.”<sup>51</sup> The arrow of time is a metaphorical description of a scientific concept called entropy, “loosely, the ‘disorderliness’ of a system...The entropy of any system left to its own devices will either increase with time or stay constant; that is the celebrated second law of thermodynamics. The arrow of time comes down

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<sup>48</sup> Walter Smith. 372

<sup>49</sup> Walter Smith. 372-3

<sup>50</sup> Walter Smith. 373

<sup>51</sup> Sean Carroll. 3

to the fact that entropy increases toward the future and was lower in the past.”<sup>52</sup> This concept may be difficult to visualize at first, but in reality, “the steady increase in entropy is a phenomenon often observed in the everyday world. A drop of ink in a glass of water spreads out in an expanding cloud, a cloud we never see collapse backward into an ink drop.”<sup>53</sup> However, while entropy saves the concept of the direction of time, and thereby puts a notch in presentism’s implications, it does not prove eternalism as a better belief. In the end, both presentism and eternalism are still equally improvable doctrines that the scientist must choose between. If, for the sake of time travel, eternalism is held to be true, then how does the reality of the past and future affect our relationships with them?

## II

Another difference between the past and future that interests many time travel writers is the changeability of each. Changing the future does not give many scientists a great deal of pause – after all, it is a concept built into the way we live our lives. By making every day choices we essentially ‘change’ the future; we often imagine that if we had selected Door A instead of Door B, then things would have been different. These options give us only a false sense of control, of course. The future is never literally changed, for the future follows the single path of the choices we make: “‘suppose that someone says ‘I can change the future. I can do this or I can do that.’ Well, then, suppose that he does that. Has he changed the future? No, because doing *that* was the future.’”<sup>54</sup> But this *feeling* of changeability often gives changing the future a free pass from scientific and logical criticism. On the other hand, changing the past is an intensely popular problem, one that has led to the mass amounts of paradox theory in the next section of this essay.

For some, changing the past is as simple a matter as changing the future; one just has to get to the past to change it. Science fiction writer Larry Niven even wrote a metaphysical law against time travel that reads: “if the universe of discourse permits the possibility of time travel, and of changing the past, then no time machine will be invented in that universe.”<sup>55</sup> The brevity of Niven’s Law requires some expansion. According to his rule, if a time machine were invented, time would immediately split from the single line it had followed up to that point into an infinite number of possible future lines. Statistically, at least *one* of those lines would hold the possibility of a time traveler returning to the past to destroy the very time machine he had used, thereby preventing time travel. It is an

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<sup>52</sup> Sean Carroll. 3

<sup>53</sup> Paul J. Nahin. 228

<sup>54</sup> Paul J. Nahin. 192

<sup>55</sup> Paul J. Nahin. 45

interesting concept, but, as shall be seen, changing the past is not so easy, and in fact is more likely impossible.

As evidenced by Niven's Law,

if a time traveler journeys into the past and introduces a change (indeed, his very journey may be the change), then...splits into two versions, with one fork representing the result of the change and the other fork being the original reality before the change...Indeed, according to this view the entire universe is splitting, at every microinstant, along every alternative decision path for every particle in the cosmos! This is often called the theory of *alternate realities with parallel time tracks*.<sup>56</sup>

Time is like a spider web, or more accurately, a complex series of railways. The actions of every individual, every particle, in the universe control which path the train of the present takes into the future. We can imagine that this would make time travel even more difficult, for the machine would have to be able to navigate the infinite number of alternate time tracks to find the correct path of the past. This spider web effect is not just fantastic speculation, either; it "seems actually to have some scientific plausibility because of the so-called many-worlds interpretation of quantum mechanics, pioneered by Hugh Everett III in his 1957 Princeton doctoral dissertation."<sup>57</sup> However, time travel still operates under relativity theories and not quantum theories, and so "for most time travel theoreticians there is *one* time track, and the past is unique and inviolate."<sup>58</sup> If there is only one time track, then it becomes impossible to change the past. Perhaps a time traveler wishes to return to the ancient world and introduce technology long before it is naturally conceived in the hopes of preventing centuries of human struggle. By planning to do so he assumes that there are two different version of the past – the 3000 B.C. that already has occurred, and the 3000 B.C. that he will change. If there is only one past, however, then he is not changing what happened at all, but *fulfilling* what happened: "if you *will* go back to 3000 B.C., then you *were* there; and if you *weren't* there, then you *won't* go back. You don't remember 3000 B.C. even if you were there (and even though that year is in the global past), because your time trip is not in your local past but rather in your personal future. This may all seem odd, of course, but it is not illogical."<sup>59</sup> The past is fixed, and visiting it will not alter anything, for we literally cannot travel back to a place we have not already been. However, this

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<sup>56</sup> Paul J. Nahin. 295

<sup>57</sup> Paul J. Nahin. 295

<sup>58</sup> Paul J. Nahin. 295

<sup>59</sup> Paul J. Nahin. 260

solidity does not mean that the past cannot be *affected*. There is a large and important difference between changing and affecting the past – “you could not...change the course of history by revealing twentieth-century physics in the eighteenth century. That does not mean you would necessarily be ineffectual during your stay in the past, however. Not being able to change the past is not equivalent to being unable to *influence* or *affect* what happened in the past.”<sup>60</sup> A time traveler’s actions could be the cause of several already established events. For example, if a time traveler traveled back to the Neolithic Age, he could very easily be the actual inventor of the wheel in its proper time. This force of influencing the past, however, can also have very negative consequences: “you cannot prevent either the Black Death in the London of 1665 or the Great Fire the following year, but it *is* logically possible that you—a careless time traveler—could be the cause of either event or perhaps of both.”<sup>61</sup>

The idea that the past is unchangeable certainly takes a great amount of pressure off of time travelers. Even the catastrophes that could possibly occur due to a time traveler’s mistakes are not events that can be prevented. A fixed past provides the time traveler with a certain sense of fatality – what will be, will be, and traveling into the past makes no difference whatsoever to the order of events. This fatalism is not accepted readily by all, however, and the theories that have been crafted to attempt to get rid of it are numerous.

### III

It would seem that, as far as temporal metaphysicists are concerned, travelling to the future is relatively easy. While time travel to the past is allowed by the G.T.R. only under special conditions, time travel to the future is confirmed by the S.T.R. with little to no difficulty. Traveling to the past is also burdened by an extensive collection of criticism involving the logical twists of paradox. More attempts have been made to disprove the possibility of time travel through paradox than have been made using actual science. And that is, of course, the problem with paradox in general – they are nothing more than logical contortions. Some theories have valid points; others are simply the petulant speculations of those who are so adamant that time travel cannot exist that they will think of fantastically ridiculous situations and machines in their attempt to discredit it. Though paradox can be an entertaining exercise for the brain, there is not a single circumstance, no matter how confusing, that can disprove the possibility of time travel.

One popular attempt at challenging the legitimacy of time travel is the well known ‘grandfather paradox’ – the basic idea, though the minor details can

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<sup>60</sup> Paul J. Nahin. 270

<sup>61</sup> Paul J. Nahin. 270

be changed at will, is that a time traveler could go into the past and murder his grandfather, thereby eliminating the possibility of his own existence. If the grandfather is dead, however, then the time traveler could never have been born, and also could never have returned to the past to shoot his grandfather; the situation is therefore impossible. Some take this paradox as conclusive proof that backwards time travel is impossible: "I could put a ticking atomic warhead into my own great-grandmother's hope chest. We know that no such warhead actually exploded. But, it seems, nothing could be expected to prevent the explosion if the warhead were there. So there must be a problem in the original supposition that I could send it."<sup>62</sup> The problem with this scenario is not the time travel, however; it's the assertion that *nothing could be expected to prevent it*. The obvious question is, why not? This theory assumes that the past is not set, that by travelling backwards we can change the whole of reality with a single act. But, as has already been established, this theory violates the nature of the past as a set entity that cannot be changed. No matter how badly that time traveler may want his grandparents dead, he has no way of killing them because they *were not killed by him*. It is widely believed that in such a situation, events would always frustrate the would-be murderer. The gun would jam, he would trip, or be apprehended last minute; any number of possibilities could occur, but "if success is logically impossible then failure, however baroquely contrived, must occur."<sup>63</sup> Though the paradox itself is only a logical assertion, the impossibility of such paradox is a fact: "there is no possible world in which someone travels back in time and kills herself as a baby... autoinfanticide is metaphysically impossible."<sup>64</sup> Even *if* it were possible to change the past, there is another theory that saves the future from experiencing catastrophic changes. In the movie "Sound of Thunder" (2005) a time machine is built to allow rich tourists to travel back to a fixed moment in time where they can view a dinosaur up close. They are warned severely not to step off the designated path but, of course, one particularly careless millionaire accidentally kills a moth. The ripples this act sends through time eventually turns all of the 20<sup>th</sup> century into a second Jurassic era in which humans resemble aquatic bipeds. It is a fantastical piece of fiction, but it completely ignores "the law of the Conservation of Reality: that when the past is changed, the future changes barely enough to adjust, barely enough to admit the new data. The Change Winds meet maximum resistance always."<sup>65</sup> For the purposes of this thesis, however, the concept of an unchangeable past will be adhered to.

Ultimately, paradox boils down to a desire to have control over the destiny of mankind. Humanity often wrestles with the constraining concept of fate –

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<sup>62</sup> Tim Maudlin. 303

<sup>63</sup> Tim Maudlin. 304

<sup>64</sup> David Horacek. 423

<sup>65</sup> Paul J. Nahin. 62



control is important, and “the ability to willfully change the past amounts to a virtual omnipotence over human history.”<sup>66</sup> Unfortunately for those who strain against fatalistic barriers, demanding that the ability to change the past be real just because it chafes against what you are ‘allowed’ to do is just as futile as attempting to breathe under water just because you feel you ‘should’ be able to. Physical reality keeps such desires in check, and as a result, “such paradoxes are often offensive only to human, culturally biased intuitions about how ‘things ought to work,’ and not to the laws of physics, which are indifferent to a reversal in the direction of time.”<sup>67</sup>

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<sup>66</sup> Paul J. Nahin. 52

<sup>67</sup> Paul J. Nahin. 197

We cannot know what time travel will be like. To imagine the sensation is to dabble in fantasy.

But the consequences of time travel restricted by the laws of physics are all too clear.

“Dr. Savitt”

*Date: March 12, 2041*

*Patient: Alec Savitt*

*Attending: Nicholas Ballam, M.D.*

*Emergency Contact: Mrs. Rachel Savitt, (443) 765-1839, Baltimore, MD*

*Relation to Patient: Mother*

***Summary of Diagnosis:***

*Patient has suffered trauma to the right side of his body as well as severe spinal injuries: broken right femur, two pelvic fractures, three broken ribs, a punctured lung, and a dislocated shoulder. Surgery to repair these breaks will be conducted immediately. The extent of the damage to the spine has yet to be established, pending an MRI. Patient has yet to regain consciousness. A breathing tube and catheter have been inserted, though other life support systems are as of yet unnecessary.*

**March 12, 2041**

Dear God, what a terrible thing has happened.

Alec was in an accident at the Institute this morning. I got the call at a little past six. That's a mother's worst nightmare, isn't it? Getting the call telling you your child might be dying? All they've told me is that he fell from the prime focus cage. I've heard Alec talk about working in the cage before. Dreadfully long nights in a tiny room at the top of a telescope eighty feet off the floor. I've always worried about him being safe in such a dangerous environment, but he assured me that it was perfectly safe as long as he was careful. Apparently the handrail was loose, or something like that, and he lost his balance...and fell eighty feet! Eighty!

They tell us he's lucky to be alive. Of course I'm glad he's alive, but what kind of consolation is that? It has about the same level of comfort as saying 'It could have been worse.' He's in such bad condition that when we went to the hospital we couldn't get in to see our own son. We waited for hours for the doctor to have a spare moment, and all he could tell us was that they had 'stabilized' him and were moving on to surgery. His injuries are so terrible...

I'm not sure what I would do without my Alec, my boy. Oh Lord, protect him.

**Date:** March 14, 2041

**Patient:** Alec Savitt

**Attending:** Nicholas Ballam, M.D.

**Emergency Contact:** Mrs. Rachel Savitt, (443) 765-1839, Baltimore, MD

**Relation to Patient:** Mother

**Summary of Diagnosis:**

*MRI revealed several fractures of the spine in the Lumbar and Cervical vertebrae and swelling of the brainstem. Patient continues to be unresponsive to physical tests. Surgery to repair fractures and relieve the pressure on the brainstem will be conducted immediately. Final diagnosis: likely irreversible coma.*

### **March 16, 2041**

I've called Daniel and Clara told them the news. Daniel should be here by Tuesday, and Clara a few days after. I wish it weren't necessary for them to come on such short notice, but Alec might...things are uncertain still.

We spent all day yesterday at the hospital, waiting for the results of Alec's MRI. They finally let us into his room and I could barely stand the sight. He's a grown man, but he's still my little boy. The bruising is extensive – he seems to have fallen mostly on his right side and back. If it had been a straight drop from the telescope he would be dead, but he apparently got caught up in the various parts of the machinery on his way down. It ultimately slowed his descent...but at such a cost. What isn't covered in bruises is covered in casting. The doctor says it's almost a mercy that he is still unconscious, for the pain would be so intense that he would have to be sedated anyway.

But they tell me he may never wake up again.

Never?

No please...please not never. Not never! Bring him back to us.

There is a brief moment when being roused from a heavy sleep where you recognize that you are waking up without also understanding that you were sleeping. This is the moment when, having dreamt that you have missed a meeting, or that your brother has died, you feel a hot flash of panic and adrenaline. The distorted memories vivify under your semi-conscious scrutiny, and another moment passes where you hold your breath, cling to the dream, and at last recognize it as only a phantom of your mind. It is then that you realize you are in your bed, safe at home, staring at the wall that needs to be repainted but is too comfortingly familiar for you to make the effort to do so. Your muscles relax, and you decide to stay in bed for five more minutes past the ringing of the alarm clock.

Alec wasn't sure that people were talking to him, but he recognized that he was hearing voices. He knew what they were saying, but did not understand the meaning of the words, if they were indeed words. He was still half asleep when the man standing over him pulled up his eyelid and pointed a flashlight directly into his line of sight.

He was fully awake in that moment, and panicked.

"Dr. Savitt, calm down," the doctor said as the nurses attempted to catch Alec's struggling arms. "We're going to take the breathing tube out in just a moment."

The breathing tube was like a fuse of fire being ripped from his lungs, choking him with ash. He gasped raggedly as it left his mouth and cooling air extinguished the flames. He felt heavy.

"Can you hear me, Dr. Savitt? Blink once if yes."

Alec wasn't sure that he blinked, but the doctor seemed satisfied with the result. He pulled out a small pin and stood over Alec's foot.

"I'm going to press this on your right big toe. Blink if you can feel it – move your toes if you can."

The sensation of the pin was so shocking that Alec kicked the doctor in the abdomen, but he seemed very pleased about it anyway.

Alec was starting to take in his surroundings. Everything was just slightly blurred, but he was unable to reach up and rub his eyes to clear his vision. The nurses still held his arms gently but firmly to keep him from pulling out any more tubes, of which there were many, Alec realized with a swelling of horror. Tubes in his arms, in his abdomen, and, it surely followed, other places he was trying to ignore. He was strung up like a tangled marionette, and he felt just as limp with confusion.

"Dr. Savitt, can you speak?"

Alec was honestly afraid to try. His lungs felt like lead as it was; the whole fluorescent room was pushing down on him. Nevertheless he opened his mouth and, after a few hesitant murmurs, managed, "Yes." *I'm in a hospital*, Alec

recognized. Doctor, nurses, tubes, flimsy gown and all hadn't tipped him off, but a sterile smell was washing over him, and he knew it as a hospital smell.

"My name is Dr. Ballam – I've been your physician during your stay here. You are at the Johns Hopkins Hospital in Baltimore." *Ahah*, Alec thought. "Can you remember anything about your accident?"

"No," Alec muttered. "What happened?"

"You fell from about eighty feet and sustained serious injuries to the right side of your body." The doctor leafed through the papers in the file he was holding and shook his head. "Broken leg, ribs, punctured lung, multiple fractures in your pelvis...you're very lucky to be alive."

"Eighty feet?" Alec felt himself frowning. "What was I doing at eighty feet?"

Dr. Ballam paused and glanced up at Alec silently. He seemed to be debating what to say, and took a deep breath. "Dr. Savitt...do you know what year it is?"

*That's not a good question.* Alec closed his eyes and braced himself. "It's not 2041, is it?"

"No, Dr. Savitt. It's July of 2049."

Most of the tubes had finally been removed, although the catheter still remained to Alec's annoyance. He sat up in his hospital bed and stewed alone, staring at his lap. Every day his mind was getting clearer, but there wasn't much there. They told him it was July, and the year 2041, but his brain kept telling him it was early March eight years ago. He remembered that he had a P.H.D., reaffirmed by the staff's reference to him as 'Dr. Savitt,' but he wasn't quite sure what exactly he was educated in. He didn't even remember his birthday – December 10<sup>th</sup>, according to the chart which Dr. Ballam had left with him. He had read the synopsis of his injuries hourly, and at each reread he felt both amazed and disgusted that he was alive. What right did he have to be alive? People only survived accidents like this if they had something else to do in life. What was he other than a partially crippled amnesiac?

There was a knock on the door and Alec looked up to see a nurse leaning in. "How are you feeling today, Dr. Savitt?" she asked cheerfully.

"Better and worse," Alec answered truthfully. "But I'm not in any severe discomfort. When will I be starting physical therapy?"

"The doctor doesn't want to rush things," the nurse chirped, "but I imagine you'll be on your feet within the week. It's going to be very tough going, and you only just woke up." She straightened Alec's sheets with a sympathetic frown.

"It will help me keep my mind off of...things," Alec said. Actually, it would have the opposite effect: it would give him something to think *about*. It

was maddening having only a few bits and pieces running around in the empty spaces of his brain.

“Oh, well then you’ll be so pleased to know that your family will be coming to see you today!”

“My family...” Alec intoned hollowly, glancing down at his paperwork again. There was a name listed under the emergency contact, but he didn’t recognize it apart from the matching surname. *Rachel Savitt*. His mother.

“They’ll be so pleased to see you awake, after all this time,” the nurse said, uncomfortably ignoring Alec’s ignorance. “They should be here within the hour. Don’t hesitate to page me if you should need anything.”

The nurse smiled herself out of the room, and Alec felt a lump of pity form in his throat. He didn’t have a family. Not one that he remembered. It was partially alright for him; he couldn’t miss what he didn’t know. But they had waited eight years. The partially wilted flowers on his bed-side table with a handwritten note – *Always thinking of you, dearest Alec* – proved as much. How could he bear telling an eager and excited family that he had no clue who they were? How could he bear telling those celebrating people that they hadn’t gained back a son and brother...but had lost him all over again?

Alec raised and peeked under the sheets that covered his scrawny legs and wished that he had been allowed to start physical therapy sooner. If he could walk he would be hiding in a broom closet by now. Or the morgue. He grimaced as the term ‘dead-man walking’ crossed his mind.

In order to avoid his building anxiety about the dreaded meeting, Alec simply closed his eyes and pretended to go to sleep. It was quite easy to do – despite being in a coma for eight years, he was dreadfully tired. His sleep was constantly being interrupted by tests and nurses checking up on him. He almost wished they would just leave well enough alone. If he died at this point, he would consider it well-deserved.

*Ah, but you wouldn’t want to disappoint the audience,* Alec thought as his mind drifted and his body relaxed. *You’re a true medical miracle case now. And you don’t let the prize pony prance off a cliff.*

Alec smirked a little. *Was I always this eloquent?* His let the smile drop because he didn’t know.

“Alec?” a soft voice whispered at the edge of his bed. Alec’s eyes flew open and he shifted his body more upright immediately. “Oh, I’m terribly sorry.” The petite woman standing by his side stepped back a little and looked dismayed. “I didn’t mean to startle you darling.”

“That’s alright,” Alec said, staring at her. She must have been moving into her sixties, easily, though she didn’t look as old. Other than the barely noticeable veil of wrinkles on her round face and the general sheen of silver in her

previously brown hair, she still looked middle-aged. She sat down gingerly in the chair next to his bed and gripped the hand of the tall man standing next to her.

“It’s good to see you awake, son,” the man said huskily. His shoulders were squared and his body stiff, but that didn’t stop his chin from trembling. Like his wife, he had aged well, though his face had gone the rugged path rather than the delicate one.

Both were new to Alec, and he didn’t know what to say.

His mother reached out her other hand and placed it gently on top of Alec’s. “The doctor told us about your memory, Alec,” she said softly. “It’s alright if you don’t remember us. We’re just glad you’re back.”

Alec looked back down at the sheets over his knees. “You’re my parents?”

Alec’s father let out a strangled gasp and turned away quickly, stifling the sound with his hand as he excused himself from the room. The woman looked very uncomfortable and she clasped her own hands over her lap, as if *someone* needed to hold her hand for her to remain composed.

“You’ll have to forgive your father,” she said. “He’s always been very sensitive to hospital environments. He was especially hit hard when the accident first happened. We were all so very upset, of course...but I’m afraid he just isn’t equipped to handle these kinds of tragedies. And with his own son...”

“Can you tell me what exactly happened?” Alec asked. “Perhaps a little about myself?”

“Of course, Alec!” his mother said briskly. She straightened herself on her chair. “When the accident first happened they wouldn’t tell me very many details. But eventually it all had to be explained – there were all kinds of investigations conducted about whether or not safety procedures were being followed, and what the most likely cause was for your fall. I suppose I should start with your profession.

You are an astrophysicist. You graduated with the highest honors from the California Institute of Technology and received your PhD at Princeton – we’re so very proud of you – and immediately after you finished school you accepted a job at the Space Telescope Science Institute here in Baltimore. I’m not sure what exactly you were up to at the time of your accident, but you fell from the prime focus cage” – she squinted as she recited the term – “of one of the telescopes and missed your step somehow.” She cleared her throat. “On the way down you...got caught up in the machinery enough that your descent was slowed and you were not killed. But by the time you did reach the floor, you had sustained very serious injuries. And that’s how you ended up here.”

Alec raised his eyebrows and sighed. On a whim he blurted out, “What’s my favorite color?”

His mother smiled, her face crinkling ever so slightly. “Navy blue.”



*Wretched color*, Alec thought spitefully. “I’m so sorry,” he replied. “I just...I don’t remember much. The bits and pieces I do have don’t make any sense yet. I’m very lost.”

She pressed her lips inward and nodded falteringly. “I know. I know. It will be a long, hard road for you.” She sighed. “But we’re here for you. We still have all of your belongings. We moved them to our house after they confirmed your coma. There’s a room all ready for you, when they finally let you out. You can use it for as long as you please until you figure out where you are going.” She looked up at him and smiled away the building tears. “I hope you will accept help from strangers.”

Alec felt his face draw towards his lap. “Please...don’t...”

“Well, it’s only true,” his mother replied brusquely. “We can’t change your memory just because we want it back. We couldn’t fix your brain damage, either, just because we wanted you back. We’ll just have to get used to the way things are, and that’s that, and wait for something different to happen. It has worked before.”

She then extended her hand to her son and said, “Hello, Alec. It is very nice to meet you again. My name is Rachel. If you like, you may call me Mom.”

It was several weeks more before Alec was ushered into the front seat of his father’s car, annoyed at the nurses’ insistence upon his use of a wheelchair. His physical therapy had started agonizingly, frustrating him at every step, but his determination to walk had fueled his progress so that, once he at last was on his feet, he had taken every chance he could to exercise. There was no need for a wheelchair now.

“They’re just eager to help,” his father said good-naturedly as he pulled the car away from the curb and into traffic. “It’s their job.”

Alec had nothing to say to that, though the temptation to be unreasonable was great. On the other hand he was starting to get frustrated with his own irritability. Whether or not he had been an ill-tempered individual before the accident, he didn’t know, but he was determined to try and not be one now.

“We live not far from the hospital,” the older man mentioned. “It’ll be about a half-hour drive south. It’s the same house you grew up in. Your mother and brother and sister are waiting to welcome you home.”

“I suppose it will be very strange for everyone,” Alec mused, “seeing me back.”

“No, I don’t think so,” his father replied. “It will be a relief. It will also be a relief if no one cries, and I include myself in that statement.”

Alec smiled. “I guess we’ll see.”

“You know...no one expects you to be anything than who you are. And if you don’t know who that is yet, then that’s fine. I don’t want you to feel pressured,

or uncomfortable. We all know you're still working things out. You'll have a free run of the house, and if that means you want to talk, that's fine, but if you would rather have time to yourself, no one will bother you."

"I appreciate that," Alec said sincerely. In the hospital, and even now, he felt too much like an invalid or a child. Everything was being provided for him. But he was thirty-six now, though perhaps he still had the mind of a twenty-eight year old man. Was there a large difference between the two? Either way he was too old to be a burden on his parents.

"Your mother already told you that all of your belongings are at the house. A good portion of them are in the attic in storage – we just didn't have enough space in your room for everything – but all your books and research are immediately available, and anything else your mother thought you might want when you woke up."

"Did she really believe I would?" Alec asked. As he had gotten to know her over the past month, he had noticed that she was a very practical woman. Surely she would not have deceived herself about Alec's unpromising condition.

"We all had hope, of course," his father said. They were turning off the main highway now and into more residential spaces. "I'm not sure your mother believed that you would necessarily wake up, but she certainly did not believe that you were gone forever. She prayed for you constantly, visited you nearly as often. We all tried to visit as much as we could, but your siblings live so far away, and my work often takes me traveling." He looked a little guilty to speak of it. "But your mother was consistent."

"Don't feel too bad about it," Alec said dryly. "I couldn't have been much company."

His father laughed. "Well, the nurses always encouraged us to talk to you when we were there. They said some of it might get through, and you never know what might trigger the brain into activity again. Your mother was the best at that too – she very rarely runs out of things to say, and when she can't converse any longer, she prays."

"She's religious then?"

"Oh yes. She was raised a Presbyterian. I grew up in a Baptist church, but I've never been quite as good a Christian as your mother. If I'm going to talk to God, I'd rather do it on my own."

"And my brother and sister?"

"Well, Daniel actually went to seminary several years ago and became a pastor. Clara goes to church *now*, but she spent most of her youth rebelling against the idea of organized religion. You and Clara got along very well growing up."

"Didn't you say she has a daughter?"

“Yes, Emma. She’s five now. She’ll probably act very shy at first – she’s only used to having the one uncle.”

Alec ran down the list of names again in his head: *Rachel – mom; Tom – dad; Daniel – older brother; Clara – younger sister; Emma – niece.*

Alec’s father looked over at him, noticing his contemplation, and squeezed his shoulder briefly. “You’ll get it all soon enough. Don’t worry too much about the details.”

An enormous and very fluffy dog greeted the approaching car as Alec’s father at last turned off the road and pulled into the driveway of a medium-sized house. His tail was wagging vigorously, but his bark still made Alec assume that he was a competent guard dog.

“And *that*,” Tom said, “is Tiger. Emma named him. Clara was reading the jungle book to her at the time and now the kid has had a thing for tigers.”

“Sounds like a better name for a cat,” Alec said, letting his seat-belt withdraw with a snap.

“We had a cat once. Then Tiger came along and she snuck off into the woods and was never seen again. Be careful getting out. Tiger will think we’re going for a drive. That dog thinks everything is for him.”

True to the warning, as soon as Alec’s door was open even a crack an enormous black muzzle was forcing itself into his lap. He pushed himself out of the car with some difficulty.

“Get back Tiger!” Alec’s father yelled, and the dog leapt backwards immediately. He landed with his nose near the ground and his tail in the air, ready to play a game. “Are you alright to walk into the house? He could easily knock you down without meaning to. Or meaning to.”

Alec was holding on to the top of the car to keep his balance (the bane of his existence, even after all the physical therapy), but felt his skin prickle at the question even so. “Let me try to make it myself,” he said. “If I end up on the ground, it won’t kill me, and I’ve survived worse falls.”

Tom looked both concerned and amused, but did not reply and stood back to watch.

Alec closed the car door and began moving gradually up the lawn towards the front porch. Halfway there, Tiger sprang into action and goosed Alec squarely with his nose. The attempt to stay upright while also spinning around in surprise put Alec flat on his back to receive his proper greeting from the dog.

“What on *earth* is going on?” Rachel had come out of the house just in time to see the crime in progress. At her voice Tiger stepped away from Alec’s face and obediently sat, still as a statue.

“Oh, he’s alright, Rachel,” Tom said, his shoulders shaking with suppressed chuckles.

“I am,” Alec gasped, scrubbing his face with his shirt as he sat up in the grass. “Just getting rid of the hospital smell.” He reached out and patted the dog’s brawny shoulder.

“Well then,” Rachel said, relieved. “You can all come in and have some lunch. Emma has been helping me make grilled cheese sandwiches.”

Tom helped Alec to his feet and kept a hand on his shoulder up the porch stairs. Alec was thankful that he removed it as soon as they were past the danger zone, though he felt guilty for feeling so.

It was a typical home – talking, laughter, the gentle noise of dishes being washed in the kitchen; a few scented candles were lit on a decorative table; pictures of the family all over the walls, as well as a few paintings. The whole of it felt very surreal to Alec, as if he was walking into a Hallmark family film. *Have I ever seen a Hallmark movie?* Alec couldn’t recall a time when he had, but new the cliché somehow. It was bits and pieces like these that kept him grasping to uncover more memories, but none came. Where his face smiled out at him from a few of the portraits, he was with people he didn’t recognize, excepting Tom and Rachel.

Clara was at the sink, washing the dishes with Emma clinging to her knees. Daniel was arranging the sandwiches on a platter next to a bowl of fruit. It was easy to assume who they were because they were the only ones in the room.

“Here they are!” Daniel cried robustly. He reached out his hand to Alec’s and shook it heartily. “Good to see you back on your feet.”

“Hello Daniel,” Alec said. And, awkwardly, lest they forget, “Nice to...er...meet you.”

Daniel just smiled.

Clara had turned around now and was drying her hands on a towel. She leaned down to Emma’s level, tucking a blonde lock behind one ear. “Emma, that’s your Uncle Alec.”

Though clearly intrigued, Emma shrank back a little further into the safety of her mother’s legs. A barely audible “hi” managed to make it past Clara’s jeans. Clara looked up at Alec, grinning an apology. “It’ll take her a bit.”

“Oh that’s fine,” Alec said. *I know how she feels.*

“Let’s just go ahead and eat, shall we?” Rachel said cheerfully as she gathered up the plates. “You can get to know us all a little better while we have lunch.”

Any gaps in the conversation were easily disguised by Alec’s concentration on the food. And he was truly concentrating on fitting as much of it in as possible without appearing to be gluttonous. Each time his plate emptied, Rachel would lean over and place something else on it with a subtle smile on her face. At least *she* was on to him.

Daniel was a pastor in New York as well as a seminary professor. He had not yet married, but he hoped to one day, if he met the right woman. He was currently writing his second book and planning a trip to China.

Clara had divorced her husband three years ago and had moved to Colorado with Emma, then two. She had started out working from home as a freelance writer and editor for several magazines, none of any particular prestige. Last year Emma had been forced to spend several months with her grandparents when Clara's ex-husband had been sent to prison for drug dealing and rendered unable to pay child support. The two had been reunited when Clara secured a part-time job teaching at an elementary school to supplement her writing. It was just enough to keep her and Emma happy.

Emma liked tigers, and she, sitting next to Alec at the table, finally warmed up to him enough to tell him repeatedly. He arranged her peas in the distorted shape of a tiger and they became instant friends.

Sitting at the desk in his bedroom later that evening, he mulled over all these facts repeatedly, hoping to kick-start his memory. Nothing was sparked. They were lovely people...he just didn't remember them. He pulled out a piece of paper and poised his pen over it – Dr. Ballam had suggested trying to write to bring his memories back. As if ink and paper were magic tools for digging deep into parts of the brain that had forgotten themselves. Alec closed his eyes and skeptically wrote the first thing to pop into his head.

**For two frames at rest,  $\gamma = 1$ , and increases with relative velocity between the two inertial frames.**

He opened his eyes and read it. Then read it again. And again.

He didn't know what it meant.

### “Man’s Proper Time”

“Alec? Are you upstairs?”

Alec put down the third photo book he had been paging through and leaned out over the attic ladder to see his mother approaching.

“Any luck?” she asked when she saw him.

“None,” he replied, discouraged. “These are all new to me. I’m getting a good idea of who I might have been, but...it still doesn’t feel like me. I’m a stranger to myself, and I matter just as much.”

“Perhaps you should try something other than the photo books,” his mother suggested gently. “How has your writing been working?”

Alec snorted bitterly. “Not at all. It’s gibberish. I write the same things over and over again, and they never make any sense to me.”

Rachel looked thoughtful. “Do you mind if I look at them? Perhaps I can make a connection that will be helpful.”

Alec lay the book aside and descended the ladder tentatively, wincing at every crack and creak from the old slats of wood. He led his mother to his room and hoped she didn’t notice that, after two weeks, it still looked barely lived in. He had moved practically nothing, and most nights just lay on top of the bed, blankets and all, thinking.

Scooping up a handful of the scattered papers, he straightened them and passed them to his mother, who began sorting through them slowly.

“If I had to guess,” she said, looking surprised, “I would say these have something to do with your studies. They mean nothing to me as well, but they’re clearly scientific.”

Alec picked up another scrap of paper and scrutinized it. **R sub ‘s’ is equal to 2.9644 times 10 raised to the 13<sup>th</sup> power M sub 8 centimeters.** It suddenly hit him and the sensation made his skin tingle with hot surprise. “These are astrophysical equations.”

Rachel looked up at him. “But what do they mean?”

Alec dove for one of the boxes that he had yet to go through thoroughly labeled *Graduate Work*. When he had first opened it, he had pushed it aside, overwhelmed by the sheer amount of paperwork. Now he was mentally strangling himself for being so lazy and possibly wasting so much time when the answer could have been before him all along. There was a thick packet of paper on the top, and Alec picked it up with the closest thing to a prayer he could managed on repeat in his mind.

He flipped it open to the first page and began to read. He read the first sentence four times, the next sentence twice, and then found himself passing page after page, skimming what he did not remember writing.

“*Christ,*” he choked hoarsely.

“*Alec*,” Rachel admonished, but she immediately followed with an eager, “What is it?”

“It’s my doctoral dissertation,” Alec said weakly. “I couldn’t begin to explain it but...I can *understand* what it says. I *know* this.”

“You remember something?” Rachel asked, rising on her toes with enthusiasm.

Alec grabbed some of the pages that were strewn over the floor and scanned them eagerly. “Yes...I mean no. I don’t remember any of this, at least not learning it. But I *understand* it. Like an instinct.” He set aside the dissertation and pulled a second packet from the box, skimming it. “Every word is at the same time new and familiar. How cliché...I mean...it’s so terribly hard to explain!” He muffled a shout of frustration between his teeth.

“Like something you memorize as a child,” his mother suggested. “When you hear it again as an adult, you don’t recognize it, but somehow know all the words.”

“I suppose so...” Alec was back to reading, paying more attention to detail now and marveling at the strangeness of it all.

“Don’t worry too much about explaining it, dear,” his mother said. “We can’t explain a lot about what has happened recently, so we’ll just take it for granted. I’ll leave you to your reading.”

“Mhmm,” Alec nodded, but he didn’t even see her leave the room.

Alec spent the next several hours shut up in his room. Rachel and Tom sat in the lounge quietly, pretending to read while really their thoughts were with their son. At around five o’clock, Rachel put her novel down with a tense sigh and glanced out the window at the yard which was ripening into a luscious green with the summer heat. Tiger’s eyebrows twitched in her direction and his tail gave an inquisitive flop.

She considered calling Clara and Daniel to inform them of the change in Alec’s memory, but decided against it. She could be patient and wait for Alec to share the good news. Or the bad news...she could tell he had been excited at his discovery, but the impatient frustration that reigned in his expectations was all too noticeable. She was sure he didn’t believe it could be possible.

*He was always so hard on himself before the accident too*, she thought. Growing up, Alec had been the kind of boy to dispraise himself more than anyone. Perhaps it was his self-doubt that had always pushed him to do and be better than his peers in whatever subject he could. His drive had made him a fairly unpopular playmate, and much of his life had been spent in the exact same way he was spending this afternoon: locked up behind his door, studying frantically, looking for an answer that would relieve him of the pressures he put on himself. He hadn’t

changed a bit, even if he wasn't aware of it. *It's not enough to be told*, Rachel reminded herself, *if what you really need is to know for yourself*.

Alec did not emerge for dinner, and Rachel did not dare interrupt him for the meal. She arranged a plate for him and placed it in the refrigerator.

Finally, after more than eight hours tense quiet in the house, Tiger could stand it no longer. A piteous whine began in his throat that was interrupted by several anxious yips.

"Enough of that, Tiger," Tom said from the chair where he had started to doze. "It can't be exciting all the time."

"I've had just about enough of the quiet too," Rachel said, standing suddenly. "Come on Tiger. Let's go for a walk."

She was reaching for the leash when, from upstairs, they heard Alec begin to move around. Man, wife, and dog stood at attention, listening to the creaking floor, then the sound of his door opening, and the loud thumps of his feet on the stairs. He entered the lounge with tired eyes and what appeared to be a letter in his hand.

"Well, how did it go?" Tom asked.

Alec looked conflicted. "I still don't remember anything about my life preceding the accident. Not friends, not family, not events...nothing. But somehow I still know astronomy and physics. I can tell you how far away countless objects in space are from the earth, in our galaxy and out of it. I can calculate Maxwell's equations until I'm blue in the face, but I can't tell you what I did on my eighth birthday, or who my friends in college were." He shrugged resignedly. "*This*," and he held out the letter, "is all I have to left."

Rachel took it with a growing trepidation and began to read it, Tom leaning over her shoulder to do the same.

## **February 25<sup>th</sup>, 2041**

To the attention of Dr. Alec Savitt,

My name is Dr. Isaac Venn and I represent the Maudlin & Smith Astro-Metaphysical Lab. I am currently in the process of seeking to fill the position for Senior Astrophysicist at M.S.A.L and, in speaking to several notable professionals in the field, find myself continually being referred to you as one of the most preeminent young astrophysicists in the country. I have read your dissertation on the motion of the solar system in relation to the expansion of the universe, as well as your other recently published works, and found them to be quite exceptional pieces of study.



However I am not writing to you to discuss the finer styles of written astrological discourse. To be frank, as I prefer to be, I am offering you the position and a significant place in our most rapidly developing project studying the current state of distant structures in the galaxy. No interview, references, or capability testing required. Your recommendations have already been heartily supplied, and I am willing to take the chance that you will be intrigued enough by our project, once you hear more, that you will join without a second thought.

If I have been vague enough so far to pique your interest, then do call on me at the number provided below or, better yet, visit the lab in person. If you are not interested, however, feel free to dispose of the letter as you please (though I recommend recycling as the most politically correct choice).

With all respect,  
Dr. Isaac Venn, (571) 511-2400, ext. 999.

Tom wrinkled his nose. “That’s the most unusual business letter I’ve ever read. What does he mean, the *current* state of structures in the galaxy? We have telescopes that can show us that.”

“Yes and no,” Alec said. His father was missing the point.

Rachel, on the other hand, had not. “So you’re leaving us,” she said quietly, handing the letter back to Alec.

“Leaving?” Tom exclaimed. “For a project like that? Surely not.”

“It’s the only offer I have,” Alec replied, folding the letter. “I’m thirty-six years old. That’s a little late to be living off of my parents’ good will and income.”

“Yes, of course,” Tom said quickly, “but that letter is eight years old. How can you know the offer still stands?”

“Projects regarding the study of space take years,” Alec said patiently. “This project is likely still underway. I already tried calling, and,” he snorted at the letter, “I was sent to a full voicemail inbox. The only way to know for sure is to go there in person and inquire.”

“Where is the lab?” Rachel asked. “If you need a ride...”

Alec winced. “I—I appreciate the offer, but no. The address is just outside the District of Columbia. Public transport can get me there easily enough.”

Rachel and Tom stood quietly for a moment. His mother reached out for her husband’s hand and grasped it tightly.

Then with a sudden nod of her head, Rachel began walking towards the staircase. “Well then, I’ll help you pack.”

“I know you want me to stay,” Alec said. “And I’m sorry. You waited for me for eight years, and now I’m leaving again. I know it’s selfish, but I can’t stay.”

Rachel shook her head. “You don’t *owe* us for anything, Alec. Getting on with your life isn’t selfish, it’s necessary.” She put her hands on his shoulders.

“We got you back, and that’s all we could have ever asked for. No, it would be selfish of *us* to keep you in a place that constantly reminded you of everything you’ve lost.” She turned away and walked brusquely from the room. “Now come along and tell me what clothes you would like to take so I can iron them.”

Alec and Tom stared after her briefly before turning to face each other. Alec felt like he ought to say something comforting and appreciative, but was speechless. There had never really been anything he could say.

Tom reached out his hand, which Alec grasped and shook. “God speed, Alec. You know where to find us, should you ever need anything.”

Alec felt a bubble of relief growing in his chest as he boarded the train to D.C. By the time he had stored his bag and chosen a window seat in one of the middle compartments, the bubble had popped, and for the first time since he had woken up in the hospital he felt relaxation melting through his body. He had gone along with the idea of returning to his old life only because it had been his only choice. He certainly appreciated the generosity and patience his family had shown him, but, nevertheless, the unspoken pressure to be his ‘old self’ had been hanging over his head for months. Alec was completely aware that much of that pressure was self-inflicted. Neither Rachel nor Tom had ever given him any indication that they would be unsatisfied with his permanent amnesia. The attempt to revive his memories, however, had left him grasping at the past for long enough. He would never be able to be the son they had once known. The old Alec Savitt, whoever he was, was gone.

*Not completely*, Alec thought as he pulled the letter from his jacket pocket and reread it. It was dated almost a month before his accident, so he felt safe assuming that, eight years ago, he had ignored the unusual offer. If he had somewhere else to go, Alec wasn’t sure that he wouldn’t still be ignoring it; Dr. Venn was flirting with professionalism without fully committing to it, dangling a carrot of mystery that most self-respecting scientists would bypass as farcical. Even now Alec felt himself raising his eyebrows at the presumption this man had shown, offering a position to an already established astrophysicist without describing the project or the position in enough detail to explain what would be expected. ‘*You will be intrigued enough by our project, once you hear more, that you will join without a second thought*’ – well, he would see about that.

The train ride itself turned out to be a far shorter ride than the cab that Alec hired to take him out into the countryside of Virginia. Luckily his parents had supplied him with a generous amount of travel money. *I’d better send them a letter soon*, Alec thought, his spirits dampened a little by the guilt he felt at leaving them. What else could he have done, though? His mother had been right in saying that the little house in Baltimore only reminded him of what he had lost.

His mood only worsened when the cab driver pulled the car over to the side of the road and pulled out a map. “Where did you say this place was??” he asked over his shoulder, looking flustered.

Alec read the address off the back of the letter again and eyed the cab meter irately.

The driver scrutinized his map closely for a good five minutes before he finally found out where they were. Thanks to the often unlabeled dirt roads they were now travelling on, they had missed their turn by several miles. To his credit, the driver apologized for the mistake and offered to take a percentage off the cab fare when they arrived.

An off-white and grey, rectangle building of only a few stories was not what Alec had expected, but the sign, unlike the building it referred to, was large, impressive, and assured him that he was in the right place. Walking towards the building, bag in hand, he was beginning to wonder how large a project such a small laboratory could possibly undertake when a car-sized, pill-shaped capsule rose into the air from behind the building and continued to rise until it had disappeared into the sky. He stared after it, rooted to the spot for a second, wondering what it could have been. There had been no roar of engines, no clear indication at all as to how it had ascended.

The white and grey theme of the building was continued in the lobby, which was mostly empty except for the receptionist’s desk and a few young men talking animatedly near the elevators. Alec did not fail to notice the scanner that was a required feature for access to the elevators. He wondered what type of scan it was designed for, his initial opinion of the prestige of the lab beginning to be replaced by respect for its hidden potential. Not to mention that he did not believe that a three story building would be equipped with an elevator. By now the young lady at the desk had looked up at him, surprised, and said helpfully, “Sir? Do you need to check in?”

Alec placed his letter on the desk so that she could see it. “I’m here to see Dr. Isaac Venn.”

The receptionist looked immediately annoyed. “Dr. Venn’s office is visited by appointment only. He knows that and should have warned you ahead of time. I’m terribly sorry, but you’ll have to come back another day. When would you like to arrange your meeting?”

Alec also frowned. He wasn’t in the mood to be unreasonable, but he didn’t have the luxury of waiting around for a busy scientist’s schedule to open up. “Are you sure he doesn’t have any time available *today*? I came from out of town.”

The woman sighed through her nose and picked up her phone, tapping the keypad vigorously. “Dr. Venn,” she said crisply. “There is a gentleman here to see you. He has a letter from you dated...” she glanced at the paper and her eyebrows raised in shock, “February of 2041.” She had now turned scrutinizing

eyes on Alec. “Yes. Yes, I’ll inform him. And Dr. Venn, *please* remember to tell your visitors to *make an appointment* ahead of time!” She put the phone down and pulled the letter towards her. “You’re a bit overdue, Dr. Savitt. Why the wait?”

Now it was Alec’s turn to be annoyed. “I was in a coma until a couple months ago.”

The woman looked abashed, but her only response was, “Well, I’m glad that you are in the condition to visit us. Dr. Venn will be here shortly, if you would like take a seat.” She indicated a small gathering of cushioned chairs in the corner and returned to her paperwork.

Alec had barely sat down when the elevator doors opened and a man walked leisurely into the lobby, his identification badge gripped in his teeth as he straightened his tie. His eyes fell on the now rising Alec and lit up with recognition.

“Ahh, Dr. Alec Savitt.” He removed the laminated badge from his mouth and extended his free hand for Alec to shake. “I am Dr. Isaac Venn – you may call me Isaac, if you are so inclined, and I hope you will not mind my presumption if I refer to you from now on by your first name as well.”

Alec raised his eyebrows as he shook Dr. Venn’s hand in bemusement. He was not so inclined, and he did mind, but he had the feeling Isaac would ignore any protests he made for more professional behavior. “Dr. Venn. It is nice to make your acquaintance. I apologize for being late.

“That’s no matter,” Isaac replied. “Circumstances beyond your control, though I *am* surprised that you made your way out here so soon after being released from the hospital. I have been following the story on the news,” he finished in explanation. “If I may ask, why have you decided to come now?”

“As opposed to when you first sent the letter?”

“Precisely.”

“Circumstances beyond my control,” Alec echoed. “I am in need of a job, and I am exploring the options that are available to me.” He hoped that Dr. Venn would leave it at that, at least for the moment.

Thankfully, he did. He turned to the receptionist and smiled attractively. “Jessica, *thank you* for showing the best hospitality to our esteemed guest. I appreciate your constant willingness to cope with my refusal to follow ridiculous rules.” The very fact that his tone of voice was sickeningly polite gave Alec the impression that he was blessing the receptionist with a large serving of sarcasm. Her frosty glare, delivered in silence, burned into Alec’s back as Dr. Venn led him towards the elevators.

“Charming young woman,” Isaac mentioned under his breath. He flashed his identification badge under the scanner and, following a green flash of approval, leaned over to clear the retinal section of security.

*Well, well,* Alec mused. *More secure than I would have guessed.* Which reminded him. “As I was walking in,” he mentioned, “there was an unusual capsule that rose from behind the building. What was it?”

“Where we are going,” Isaac said as they stepped into the elevator. The number of buttons was astonishing, and none of them went above ground level. Isaac selected the negative twenty-eighth floor, and Alec’s stomach clenched with the initial plummet. “You are eight years behind technology, my friend,” he continued. “And Maudlin & Smith is about as ahead of technology you can get in *this* day and age. No one would know, of course, because most of our work is classified. Private funding means private projects. What you saw was one of the world’s only atmospheric elevators. I’ve forgotten the details as to how it works.”

“Magnetics?” Alec suggested curiously.

“Sounds about right,” Isaac replied lazily without conviction. “Most M&S employees use the traditional elevator to commute to their department, but we get the fancy tech because our office is in the upper ionosphere.”

Alec’s mouth opened long before he managed to speak. “That’s impressive”

Isaac glanced over at him, hands clasped behind his back, and smiled slightly. “Almost to space. We’re just within range of the earth to prevent being flung off into the vacuum, but high enough to avoid the more dangerous turbulence that the ionosphere is capable of. Nevertheless, there are some aspects of the station that make it *feel* like one is in space. It’s cold, it’s dark, it’s quiet. We have light and heat, of course, but the quiet can get unnerving. I have suggested playing light classical tunes, but no one seems to be catching on to the idea. Here we are.”

The doors opened to reveal a rather narrow hallway connecting them to yet another set of elevator doors. Isaac was compelled to insert his index finger into a little slot to the right of the door, where a blood sample was taken, scanned, and approved.

“That must get tiresome,” Alec commented sympathetically.

“They’ve actually had to lengthen the needle,” Isaac explained, “which is still tiny, because of the calluses we on the team have developed over the years.” The doors whisked open and he gestured Alec in.

The capsule interior was vacant in the middle with chairs protruding from the walls all the way around. Alec chose a seat opposite to Isaac and strapped himself in. As he did so, the central area of the capsule lit up with a faint glow and a hologram map of their ascent appeared.

“Why does the capsule start underground?” Alec asked. “Surely that is more inefficient than if the elevator originated on the surface of the earth.”

“It would be more efficient that way,” Isaac agreed, “but sometimes inefficiency must be the cost of privacy. Remember, this is one of the *only*

atmospheric elevators in the world. We only know about the other ones that exist because they are publically known, and the companies that own them are harassed constantly by various governments for the designs, by wealthy thrill seekers who want to go to space, etc. We don't want that kind of attention."

"From the looks of the surface building," Alec mused, "it seems as if the laboratory doesn't want attention at all."

"We do dabble in smaller projects that are publically announced," Isaac admitted. "But they are easily overshadowed by the larger companies. After all, 'the better part of valour is discretion.'"

On the hologram the little orange blip that was the capsule began to move upwards on a glowing, cyan line. Alec felt a certain amount of force push him down in his seat, but it was a far gentler an ascent than he would have predicted.

"How fast are we moving?"

"Faster than it feels, but slow enough that the journey will take us a few hours. We will gradually accelerate to approximately one-hundred miles per hour and hold that speed for most of the trip until we reach the deceleration zone, marked in red on the hologram, at which point our ascent will slow so that we can dock. You are actually quite fortunate in your timing. Due to the length of the commute, most scientists who work in the ionospheric offices spend a few days at a time in orbit. We are restricted, unfortunately, to being present on the station for up to only one week at a time."

"Unfortunately?"

Isaac's mouth once again twitched into an oddly cold half-smile. "Not everyone requires 'down-time' on Earth. My life has been my work, and I do not enjoy having my time squandered by overprotective policy writers." With that, he pulled a phone-sized electronic notebook from his pocket and said apologetically, "I hope you will not mind if I spend the time of our journey, then, working? I assure you we will have plenty to talk about once we arrive, and the introductions will go more smoothly if I have accomplished this task whilst in transit."

"By all means," Alec said politely. He could wait a little longer to understand what this project was all about. He had also lately learned to appreciate moments of silence in contemplative thought, dredging through his recently remembered knowledge. He wasn't sure that the sensation of remembering something as if for the first time would ever get old.

The experience of docking was just as exciting as taking off was – if anything, Alec was at least impressed with the smoothness of the elevator, which he supposed was one of the greatest perks to getting into the upper atmosphere without a rocket. But the inside of the 'offices' as Isaac had called them were bustling with activity in the way that the earth-bound offices had not been (at least

what Alec had seen of them, which he reminded himself had been but a small percentage).

“We are limited, in a way that the ground-level offices are not, by space,” Isaac explained as they passed among the other scientists, all walking different directions. “The ionospheric offices are about as large as a small school building, with only a few ‘floors’ separating expanding the horizontal area we have. And I’m sure you’ve noticed by now that we are horizontally oriented.”

Alec started as that significance hit him. “Artificial gravity?”

“Not *artificial* gravity, per se, but an extension of the Earth’s gravity. Technically, our feet are pointed towards the Earth’s core, as they would be if we were standing on the ground. Unfortunately, it’s not one of *our* inventions, but the designs have been widely spread enough that we have been able to replicate it. We were even able to tweak them a bit to create truly *artificial* gravity for use in ranges of space outside of Earth’s gravitational field, but once again,” he mimed zipping his lips closed, “mum’s the word on that until further notice.”

They turned a corner and Isaac pointed to a door with a plaque that read ‘Department of Paradoxy.’ “First destination,” he said. “You might want to leave the talking to me. Two of us might confuse them.”

He pushed the door open without knocking and shouted, “*Watch out!* It’s Leeds’ great-grandson and he has a gun!!”

A dozen heads turned to glare at Isaac dourly.

“Isaac, ‘Destroyer-of-Worlds,’” a young man sneered. He was poised over a book with one of his colleagues, but he snapped it closed and walked towards the door which Isaac still held propped open.

“Ah yes, that’s me,” Isaac replied cheerfully. “*Know that I am Time, that makes the worlds to perish, when ripe, and bring on them destruction.* That’s from the Bhagavad Gita, which is a very old book that you’ve probably never heard of.”

The young man’s sneer turned sour. “How can we help you today, Dr. Venn?”

“This is my new partner, Dr. Alec Savitt,” Isaac said, gesturing to Alec who had managed to step into the space of doorway that Isaac left vacant. “He will be accompanying me on the missions.”

Alec did not say anything to deny the statement, but he let his eyes bore holes into the back of Isaac’s head. Perhaps he ought to have demanded an explanation of the project when on the elevator after all.

“Dr. Savitt,” Isaac said, gesturing to the room, “this is the Department of Paradoxy. If you ever need a good laugh, be sure to drop by and see Leeds here specifically, though you’ll find the whole Department is of exceptionally good cheer most of the time.”

Alec raised his eyebrows at Isaac, then turned to face the young man's increasingly angry look and nodded his head. "It is nice to meet you."

Leeds smiled snidely and nodded his head in return. "And you, Dr. Savitt. Though I can't honestly say that I relish in your untimely acceptance of the position. After all, it's only the fabric of time and space that you're taking into your hands." He turned back to Isaac with a murderous glare. "And now, if you are so kindly finished interrupting our work, I suggest you go and find something productive to do yourself. You make the mess, we'll clean it up." He turned away and reopened the book that he had been looking at, and the entire Department proceeded to act as if neither Alec nor Isaac were there.

Isaac grinned and slammed the door closed as loudly as he could manage. "Doomsday prophets, the lot of them," he growled. "The day funding was wasted on their studies was the day that rational thought started to decay."

"Sorry," Alec said, finally letting his patience run thin. "But what *exactly* is this project that I have *apparently* signed on to? You've not explained the position any more than I have accepted it."

"Ah, but what did I tell you, Dr. Savitt?" Isaac said, leading the way to his own small office at the other end of the hallway. He opened the door and let Alec take a seat first. "I made it very clear in my letter that if you were so inclined to call on me, you would be sure to accept."

"You make it sound as if I have no choice in the matter," Alec said shortly, sitting down.

"Of course you do," Isaac said agreeably. "I'm betting on that probability that you'll say yes. And now that we are comfortable, I will be happy to explain." Rather than taking the chair behind the desk, he leaned against its edge casually. "In my letter I told you that we were in the process of developing a study of the *current* state of distant astronomical structures. Now, as an astronomer, you can easily tell me why that very study would be problematic."

"Perhaps it is I who should do some explaining, briefly," Alec interrupted. "Did the news program you were watching on me specify the nature of my condition upon waking from my coma?"

Isaac looked at Alec quizzically. "It made no specifications other than the typical, 'It's a miracle, oh how wonderful!' gushing comments."

"When I came to," Alec said, "I had amnesia. I could remember nothing about anything before the accident other than the date and my name. Not family, not friends, nothing. I spent several weeks with my parents, trying to make connections and get my memory back, but the only progress I made was to at last recall my education. That being said, I am the same capable astrophysicist that you invited to the project eight years ago, but if you're going to play twenty questions as opposed to simply explaining things, then you are going to try my patience to its last thread."



Isaac rubbed his upper lip sympathetically. “You remember nothing about your family?”

“Not a single memory.”

“Very well then. I’ll get straight to the point. There is no feasible way to study the *current* state of most astronomical structures due to the extreme distances that separate them from us. The speed of light is practically three-hundred million metres per second, and for most of the universe, the light emitted by certain bodies – stars, nebulae, planets, what have you – has been travelling for tens of thousands of light years, hundreds of thousands of light years even! That being the case, when the most advanced deep space telescope peers out into the depths of the universe, it is not seeing things as they *are*, but as they *were* when that light first began its journey.

“Our information on the universe is pathetically out of date. If we look at pictures of a young and vibrant star cluster, we are looking at a depiction of that cluster that very well may be older than the Earth itself, depending on how far away it is. We have no idea what the universe around us is *really* like.”

Alec nodded. “Very well. So what have you done to solve this problem?”

At this point Isaac switched positions to sit behind his desk, which he leaned across eagerly. “In order to get a better idea of what the universe looks like, we have to get closer to the parts we want to see. But it’s impossible to travel the astronomical distances in our lifetime. If we sent a machine, it would be dust by the time it got close enough to get a current picture, and those who sent it would themselves be long gone. We could send actual scientists, if we perhaps invented a cryotechnology to preserve them during the long journey, but who would be alive to see the evidence when they returned? *If* they returned?”

“The key, Isaac, is to move forward in space, but *backward* in time.”

Alec let the seconds stretch between himself and Isaac as he processed what the man had just said. Finally, he let his growing skepticism free. “*Time travel*. You brought me here to discuss *time travel*.”

“Ah ah,” Isaac said, shaking his head. “Eight years is a long time, Alec. The project was just developing when I first contacted you. Now it’s in its final stages. Time travel isn’t the realm of fiction any more, it’s real *technology*.”

Alec was flabbergasted. “You’ve *actually* discovered how to travel through time? Well no *wonder* there’s a Department of Paradoxy!”

“Bah!” Isaac snorted vehemently. “Idle laborers for an idle subject. Paradox is the realm of petulant fools who would rather fight against the laws of nature than work with them to produce great things. Look, Alec – time travel has always been a possibility according to physics. Relativity proved that decades ago. The only thing separating us from being able to move through time was the technological difficulties, and we’ve triumphed over those!”

“You’ve built a machine?” Alec asked.

“I have,” Isaac said with a grin. “And quiet by accident too. I was hired by M&S as a young man, brilliant enough to get away with just about any method of research I chose to pursue. So, since building a time machine was next to impossible, I threw funding at the problem until I found something that worked.”

“Awfully convenient,” Alec said, amazed.

“Dreadfully so,” Isaac agreed. “Money doesn’t solve problems, but it does facilitate trial and error, and there were enough particularly interested sponsors to fund my errors.”

“And you’ve tested this machine? You know it works?”

Here Isaac sat back in his chair and spread his hands apart in admittance. “I know it works – but it has not been extensively tested. Due to the nature of the machine, the first mission will *be* the best test. You see, I have essentially equipped a powerful space telescope with what I have called Tiplerian Rotating Space-Time Disruptors. They function in such a way that, while the telescope is moving forward through space, the space-time around the telescope is distorted. We may travel billions of years into space, but for us the trip will only take a matter of months.”

Alec frowned. “But the Time Disruptors you say only affect the space-time which surrounds the telescope itself, which I assume, from your use of ‘we,’ has some kind of living space also attached in which a crew would live to operate the machinery. If the range of these Disruptors is so small, how does affect the passage of time on Earth? The trip may be brief for the crew, but here on Earth time will pass normally.”

“It’s not an exact process, certainly,” Isaac admitted. “We cannot pinpoint a date for our return. There’s no assuring that we will be back at 10:00 promptly on August the 21<sup>st</sup>, 2049. It’s a machine in the real world, not science fiction. However, though there is a discrepancy between time as it passes for those on the machine, and time as it passes for people here on Earth, it isn’t as vast as it would be if you were to travel to a distant nebulae *without* the machine. Depending on how far we go out, a few decades will have passed, nothing more. A blink of an eye scientifically. This is all made possible by the fact that time is not universal. The forces of gravity can distort space-time. One man’s proper time does not necessarily have to be in sync with the general time of a given area of space, such as Earth.”

Alec was very quiet for a moment. Finally, he asked, “Why was this position never filled in the eight years that I was in a coma?”

“Many other astronomers did come and go during the project’s development stages. But as we got closer to being able to send out an actual mission, they all dropped out. The problem is, Alec, the time discrepancy which I just spoke of: once those decades are gone, there is no getting them back. I have

no qualms of travelling myself, because I have no family to come back to. I put myself through college when I got out of the foster system and was eventually picked up by M&S as a theoretical scientist. You...have very recently become distanced from your family. I truly hate to put it this way, Alec, but as far as time travel goes, your situation is ideal.”

Alec shook his head. “And you’re so sure that I’ll still give up what little I have left to travel into space with you to look at the scenery?”

Isaac’s half-baked, bitter smile returned. “Well, was I wrong?”

Alec did not answer. He knew he didn’t need to confirm verbally what Isaac had known all along.

### “The Difference Between Ghosts and Prophets”

“Half a moment,” Alec said suddenly. “You say that by traveling out into space with the use of this time machine, inevitably there will be a disconnect between the amount of time that passes for the pilots and for those left here on Earth.

“Yes – the two are called ‘proper time’ and ‘general time.’ While general time is the accepted passage of time for the Earth, for example, proper time is individualized.”

“Right. And because the machine counteracts the passage of time during the journey to said astronomical structure *and* on the return stretch, the amount of time that passes here on Earth can be minimized to a few decades.”

“That is correct. In effect, what the machine does is simply minimize the discrepancy between proper time and general time. The discrepancy becomes larger the further out one travels.”

Alec rubbed his forehead. He was developing a dull headache. “So, as you said, the machine moves forward in space but backward in time. But it only reduces the amount of time that the pilots experience; it doesn’t cancel it out completely.”

Isaac nodded patiently. “Exactly. You cannot arrive anywhere in the blink of an eye, time machine or no.”

“So what we’ll be doing is traveling into the past. I know you said it’s not an exact machine as far as arriving at a certain time, but could we not, after testing the machine enough, make corrections to the route and return closer to our initial departure? For that matter, what is stopping us from returning *before* our initial departure?” He was questioning without really understanding how it all worked, but it seemed he was hitting close enough to the mark to make sense.

Isaac hung his head and sighed through his nose. “*Nothing*, in theory. Time travel does go both directions, but as I am continually trying to explain to those dimwits in the Department of Paradox, traveling to the past is a pointless endeavor.”

Alec looked around the office pointedly. “We’re going to need coffee for this explanation, I imagine. Do tell – why is traveling to the past a pointless endeavor?”

Taking the hint, Isaac tapped a button on his desk. “Jacobs, can you please bring two cups of coffee to my office?” He released the button and turned back to Alec. “The entire policy of the Department of Paradox is to prove that time travel will inevitably bring about the destruction of the human race, if not the entire universe. Before I came along, paradox was nothing more than a complex way to convince the less fortunately educated that time travel is impossible. Of course, the invention of the time machine put a damper on this line of thought, so

now they have taken up the ever popular ‘destroying-the-fabric-of-time-and-space-and-dooming-us-all-through-your-destructive-ignorance-regarding-logic’ crap.”

A young lady knocked and entered Isaac’s office, holding a tray with two coffees, a small container of cream, and a comically large bowl of sugar. “Coffee, Dr. Venn?” she asked sweetly.

“Yes, thank you Jacobs,” Isaac said, reaching out and taking the tray from her. “Alec, this is one of our many interns, though undoubtedly the most talented. Elly Jacobs, this is Dr. Alec Savitt, the new astronomer on our team.”

Alec rose from his chair quickly and extended his hand. She was extremely pretty; hazel eyes, toffee colored hair, and a quaint dusting of freckles across the bridge of her nose. She exuded a friendly warmth, and Alec felt himself growing unusually hot.

“Nice to meet you, Dr. Savitt,” Elly said, shaking his hand exuberantly. “I imagine the next time you see me, I’ll be about your age.”

*Oh, that’s good news,* Alec thought, immediately chastising himself.

“And running the show here, without a doubt,” Isaac said without looking up from his coffee, which he was stirring four spoonfuls of sugar into.

Elly flashed a dazzling smile, and excused herself from the room.

“Are all your interns like that?” Alec asked jokingly.

Isaac did not seem to catch his implication. “Unfortunately no,” he replied with a wistful sigh. “She’s extremely hard working, positive, inquisitive, and eager to be taught. On the opposite extreme, you have Tim Leeds, the intern in the Department of Paradox.” He raised his eyebrows at Alec skeptically and mouthed, *what a shock*. “You met him earlier – the scrawny little imbecile who referred to me as the Destroyer-of-Worlds?”

Alec also raised his eyebrows. “He was an intern? He spoke quite rudely. I just assumed he was a scientist on staff.”

“Oh no,” Isaac said bitterly. “I’ve spoken to the Department head about him before, but they find his behavior quite amusing and let him continue without consequence. I wouldn’t be surprised if they hired him specifically to annoy me. In fact, I would bet my time machine that they encourage him to do so.”

Alec added cream and sugar to his own coffee and sipped at it gratefully. “You were speaking about paradox, before.”

“Ah yes,” Isaac said, and jumped back on topic. “Well, for starters, do you know about any paradoxes off the top of your head?”

“Well, there’s the one that involves killing your grandparents.”

“An *excellent* example, Alec!” Isaac exclaimed. “One of my favorites. The proper title is ‘The Grandfather Paradox,’ and the theory, as you know, states that *if* one had a time machine and could travel into the past, one could conceivably organize the murder of one’s ancestors, thereby preventing the time traveler from

ever being born and creating a paradox. There are all kinds of doom-and-gloom ideas as to what such a paradox would do to time and space. But they all share the same fatal flaw that the original paradox has.”

Alec could see where this was going. “You don’t believe it would be possible to kill your grandfather.”

“*Of course not!*” Isaac said vehemently. “First of all, the fact that you exist implies that you did not kill your grandfather before you were conceived. We *know* this to be true. It’s the local past, not 1200 B.C. for God’s sake. The very nature of this paradox insists that there can be two different pasts: the ‘first’ past, in which your grandfather survives, and the ‘second’ past in which he is murdered by his grandson. But the multiple time-lines idea does not match up with physics. There is *one* past, and therefore no matter how hard you try, you cannot go back sixty years and kill your grandfather. So what the Paradoxists are really fighting against is not time travelers, but physics. Whining about being unable to commit grand-patricide is similar to whining about being unable to breathe underwater without the aid of technology. You cannot like it all you please, but that doesn’t change the fact that human lungs aren’t designed to process water.”

Alec couldn’t keep himself from smiling at Isaac’s vivid irritation. “Alright, you’ve convinced me. There is one past. So why does that making traveling to it pointless?”

Isaac ran his fingers through his hair. “Because you can’t change it, Alec, that’s why. Time travel is a very fatalistic science, and most people do not like the idea of fate. You can’t go back to 1842 and hand a scientist the recipe for the atom bomb, creating nuclear warfare two hundred years early. You can’t go back to 1919 and shoot Hitler in the face, preventing the death of millions of innocents. The only thing you risk by traveling into the past is influencing it.”

“Ah, so you mean that a time traveler could be the *cause* of Hitler’s rise to power.”

“It could turn out that way, yes. Let’s say that a young Hitler didn’t die in World War I because a nameless stranger found him starving on the battlefield and gave him food when he would have otherwise perished. He then goes on to survive and become embittered by his experience.”

Alec whistled. “Well, that would be unfortunate.”

“Unfortunate,” Isaac agreed, “but inevitable. What has happened, has happened. Do you know what the difference between a ghost, a prophet, and a time traveler who decides to go to the past is?”

“No,” Alec admitted.

Isaac leaned forward earnestly. “Not. A damn. Thing. All three are at the same time incapable of changing the circumstances of their time and in danger of being the catalyst of events already set down.”

Alec felt a sly smile stretching across his face. He tried to straighten it out before saying, "I'm sure there are lots of prophets who have been quite effective in their time."

Isaac glared at Alec's tease. "It's not a perfect analogy," he said tonelessly. "Besides, every prophet I can think of was either killed with rocks or killed with fire."

"Which is, no doubt, the fate the Department of Paradoxo has planned out for you even now."

Isaac grinned. "No doubt. But if I've caught you up enough on my personal and undoubtedly correct views of Temporal Metaphysics, I think it's high time to introduce you to the rest of the team. We'll start with the machine itself, since that's the most important part."

He spent a moment tapping at the keyboard of his computer and, with a final flourish, gestured to the air next to his desk where little particles of light seemed to be gathering, like swirls of dust in sunlight. They milled about confusedly for a split second and then snapped together to form the image of what looked like an advanced space telescope with some very unusual modifications.

The main body of the machine was a series of sun shields, large, coffin-shaped sheets of metal, stacked one upon the other and supported by metal struts throughout so that they would not touch. On the underside of these, the computers that would be responsible for data collection ran the length of the machine, clustered in the middle and encased in a protective shield of metal. Riding on top of it all was the impressive mirror system, a series of hexagonal, gold plated mirrors arranged into a honeycomb. It was a familiar design for Alec, but it was the additions that made it seem unreal.

The least important of these was the small box attached to the underside of the whole construction. Isaac pointed to it, nearly covering it up with his finger. "That is where we will be living. It's just big enough for two operators, but it wasn't built for comfort."

"I'm trained to work in small spaces," Alec replied. "I used to work in telescopes before, as you no doubt recall."

"I recall. The majority of the time the automated computers run the show, anyway. We're just the caretakers. I suggest you bring a deck of cards with you."

"If most of the processes are completed by computers," Alec asked, "why does the mission have to be manned at all? Could we not just send out the machine and wait for it to return?"

"First of all, no," Isaac answered, "because not *all* of the processes are computer-based. Getting to our destination will require very little work on our part other than the departure sequences. Once we get there, however, there will be much more work to do. Usually when a space telescope is sent out, the data it collects has to be translated by computer programs before it can be understood."

Since we will have time on our hands, we will be completing that task directly before we return. And returning also requires our attention, or rather *my* attention: the time machine itself is, as I said, in testing mode. We need to narrow the margin of our time-of-arrival down as much as we can. Besides, if you had created what was once thought impossible to create, would you just send it off into deep space without so much as a by-your-leave and *wait* for it to come back with no problems?"

He turned Alec's attention to the most obvious and unusual addition to the telescope. The machine was caged in by six curved strips of metal. "These," Isaac said, now pointing to the curved bars, "are the Time Disruptors. The concept is based on an old theoretical time machine called the Tipler Cylinder. The idea was that an infinitely long, extremely dense cylinder could rotate fast enough to distort time at its surface. My machine is, of course, no cylinder – the concept is rather reversed. The Time Disruptors spin at such a high speed that they distort time *within*, not without, so that they only affect the telescope."

"How did you solve the density requirement?" Alec asked. "I take it those Disruptors are not made of metal."

"That was a lucky windfall, actually," Isaac admitted. "Eight years ago, before this project had really taken off, we discovered a fairly small object was moving towards the Earth. It was a chunk not of rock or ice, but a piece of an element that was completely alien to us. And, as you are probably about to guess, it was an incredibly dense element. Exotically dense. The object was intercepted by several different companies, and we managed to get just enough to craft our Time Disruptors."

"Other labs got a hold of this element?" Alec was surprised. "And what is to stop them from also making time machines?"

"Well, I seem to be the only scientist at the moment who is indulged enough to waste millions of dollars on an experimental piece of machinery." Isaac looked quite smug saying so. "But I suppose nothing could stop them if they thought it through. I doubt they will."

"Hmm," Alec replied skeptically. "Well, so you have a time machine. You say it works. Where exactly are you planning on taking it?"

"The destination is a nebula perched in the Carina spiral of our galaxy: NGC3603. It's a globular cluster of stars and a fascinating area of star birth and growth. The images we have reveal a very young formation, but, once again, they are horribly out-dated. What it looks like now is any scientist's guess. It's only six kiloparsecs away, so the trip for us should only take a couple of months."

"And for Earth?" Alec asked.

Isaac scratched his forehead and shrugged carelessly. "Without the initial test to base our estimates on, it could be anywhere from a few years to a few decades. We really can't know."



That evening, Alec sat with a pen poised over a notepad of paper, his brow furrowed in concentration. The room that had been provided for him, called by all staff members as a personal closet, was cramped and clearly made for only temporary uses. It was equipped with a narrow cot and desk, both of which folded out from the walls. A tiny sink nestled in the corner over which a single shelf hung precariously. The only storage space was that which was made by the cot when it was pulled down.

Alec tapped the pen against his forehead anxiously. He had been staring into space for at least ten minutes, and had proceeded no further than,

**Dear Rachel and Tom,**

With a disgusted sigh he ripped the page off and, crumpling it up, tossed it into the waste basket beneath the desk, starting again.

**Dear Mom and Dad,**

But the change, if anything, made it more difficult. He could feel his blood pressure rising as he struggled to figure out what he could possibly say to them. *'Dear Mom and Dad, I'm going to travel through time and you'll never see me again'*? Or, more likely...

**Dear Mr. and Mrs. Savitt,**

We regret to inform you that on August 28<sup>th</sup>, 2049, your son was reported missing in action. Due to the nature of his mission, it is unlikely...

Alec threw another crumpled sheet into the waste basket and rubbed his face wearily. He had the will, but not the words. There was nothing to say. He finally sketched out what he knew was a lame and too formal letter of appreciation for their kindness, informing them that he had been accepted by the project. Tucking it into his shirt-front pocket, he made a mental note to send it first thing in the morning.

The next few days involved meeting after meeting with astronomers, computer technicians, physicists, mathematicians, each of whom attempted to sum up the research that had been conducted in the last eight years and ensure that Alec would have no difficulties running the various and complex computer programs that would be collecting data as they reached their destination. "Most of the work is done automatically by the computer," one technician explained, a

concept that Alec was very familiar with. “You just have to be able to keep that automatic process running smoothly. By this point, if you run into any problems, then shame on us for not sending you out better prepared. Even so, in the event of a shortage of power, the computer and life support systems will revert to a backup generator...” and so on. The first day, Alec took a steady supply of notes. It wasn’t until later that evening when he was sitting in one of the crew bunks, which was basically just a closet with a cot and small sink in it, that he realized, reading over his notes, that he remembered it all word for word.

“How fortunate to be blessed with such a superb memory,” Isaac complemented him simply when he mentioned it the next morning.

Somewhere in the blur of names, faces, statistics and computer logs (Alec only made a real effort at remembering the statistics and logs), he was introduced to Dr. John McMillan. He was an older man who had determination etched into his body language and expression in an almost militaristic fashion.

“John will be organizing the research while we are away,” Isaac explained. “There is already a deep space telescope monitoring the area and gathering data on our destination; we want as much information to compare and contrast with what we’ll be bringing back.”

Dr. McMillan glanced at Isaac with critical amusement in his eyes. “Please be assured, Dr. Savitt, that the rest of the team is committed to clear communication and discipline – Dr. Venn simply gets away with much because he is allowed much.”

“Only because I *produce* much, John,” Isaac reminded. “I look forward to discussing what your team has put together when I return.”

“Much remains to be seen,” was Dr. McMillan’s only stiff reply.

The morning that Alec found himself tearing off the thin plastic wrapping from a standard navy blue jumpsuit was when it finally hit him how unusual his circumstances were turning out to be. He held the folded article of clothing in his hands, frozen for a moment in introspective thought. Eight years after surviving a fall that should have killed him, he had woken up from a coma that should have been permanent, only to discover that he still had an invitation to a project that should have been impossible, arriving just a week before the project’s initial launch.

Alec shook his head slowly and felt the fabric of his ‘uniform’ – it was thick, durable, and not particularly soft. He stripped down to his undershirt and shorts and pulled the suit up from the legs, closing it with a zipper that stretched from groin to just under his chin. It’s only decoration, other than a darker blueprint of heavy stitching, was the Maudlin & Smith logo in a rough stamp across one side of his breast. It fit close to his body without being restrictive to his movement; the wrist cuffs were not equipped with elastic, but somehow they

clung so as to prevent any gapping to occur. The suit even had socks already attached, on the underside of which were more than a dozen little circles of traction grips. He wouldn't be slipping off of anything wearing this.

The thought made his stomach twitch, but he brushed it aside. For days now he had woken from nightmares in which he found himself falling in semi-darkness. He always struggled to make out his surroundings before he hit the ground, but could never quite figure out the blur before he was startled into wakefulness by that horrible, sudden stop.

*There is nowhere to fall to*, he reminded himself as he closed the door to the small personal space behind him and headed towards Isaac's office. As he navigated the grid-arranged hallways, he returned to his original train of thought.

He wasn't the kind of man to believe in fate, but he also wasn't sure what he thought of God either. His circumstances were a little too elaborate to be just chance, though...so what exactly was arranging this elaborate show?

He turned the corner and saw Isaac leaving his office dressed in an identical suit as himself, and for the first time he was struck by the similarities between them. Both had dark hair, though Isaac's was a few shades darker than his own. In contrast, they both were quite pale in complexion, Alec from spending eight years enclosed in a hospital room, Isaac from spending most of his life under the safe roof of a laboratory.

Isaac looked up and noticed Alec's approach and seemed to make a similar conclusion, based on the mixture of laughter and horror spreading across his face. "Let's avoid walking by the Department of Paradoxy today, shall we?"

"No parting jabs?" Alec asked, surprised.

"The parries that would no doubt be received at the expense of our current state," Isaac said, indicating their dress, "would overwhelm anything I could come up with between here and there. Are you ready to go?"

Alec raised his hands slightly from his sides and let them slap against his thighs again in a shrug. "I have nothing to bring with me but myself."

Isaac raised an eyebrow. "Would you like to borrow a book?"

Alec shook his head and smiled. "If you have one you would recommend, sure, why not?"

Isaac stepped back into his office immediately and snatched a title off the shelf without pausing to think about his selection. He tossed it to Alec and started walking away from his office. "And we're off!"

Alec followed while scanning the thick volume in his hand. "Science-fiction?" he asked skeptically.

Isaac looked over his shoulder with a scoffing glance. "The time-traveler, scorning science-fiction? Come now, Alec – the history of our profession is found in stories like those. Why, what do you *usually* read?"

Alec shook his head and tucked the book under one arm. “I honestly don’t know.”

“Hm,” was Isaac’s only reply. No matter how many times he accidentally made reference to Alec’s memory loss, he never seemed to notice...or if he did, he did not know how to respond to his blunder. Thankfully, Alec was not easily offended by his partner’s carelessness.

“Isaac, do you believe in fate?”

“I should have thought the answer to that would have been evident by our discussion on the nature of time,” Isaac said, “but yes, I do.”

“Then you believe in God?”

Isaac glanced back at Alec with an unusual look on his face. “The level of trust I put in faith only extends so far. I believe that things happen in a specific way, too specific to be marked up to a simple roll of the dice. Events occur one way, and one way only, now and forever. There are no ‘what ifs.’ But I’m not sure I would extend that finality to a grand design.”

They were now approaching a large crowd of people at the far end of the office complex. Isaac slowed to a stop, observing them from a distance, and turned to face Alec. “For the sake of polite discourse, I’ll throw the question back. What do *you* believe?”

Alec kept his eyes on the crowd of scientists waiting to see them off and felt very small. “Like most things, Isaac, I’m not sure I know what I believe.”

Isaac clapped him on the shoulder sympathetically. “You have time to work it out, my friend.”

Alec smiled slightly. “Time machine or no, even that has a limit.”

It was a typical sending-off ceremony in which the director of the company made an appearance and said a short speech that no one felt compelled to pay attention to. Alec was too distracted by the sudden thought that he had never even *met* the director of the company before now. Shouldn’t he have been interviewed by the director for such an important position? Or did Isaac really have that much sway in the final details of the project?

The Department of Paradoxy was out in full force to see the fulfillment of all their fears and, no doubt, to gloat when they were proved right. Alec could tell from the strain he saw on their usually sour expressions that they had noticed his and Isaac’s matching appearances and were struggling to keep their comments to themselves.

Alec honestly wondered why their setting off had drawn such a crowd. There would be nothing to see, no mysterious flash of light or dazzling display of displaced time energy. The time machine would simply disengage from its docking point on the space offices and exert enough propellant force to set it in an accelerating motion towards NGC3603. Once they had gathered enough speed

and cleared the atmosphere sufficiently, only *then* would the Time Distorters be engaged.

The time machine itself was docked at the oriented ‘top’ of the offices, requiring Alec and Isaac to climb a series of ladders to get into the crew space. Alec understood that the reasoning for this was so that the gravity orientation would be consistent with the offices while the time machine was not in motion, but standing on the first rung of the ladder, he began feeling a sensation of vertigo.

He let one of his feet drop back to the floor and took a deep breath. Behind him, Isaac said reassuringly, “There is nowhere to fall to.”

He was right – the ladders passed through increasingly narrow spaces, areas that Alec began to realize were probably only ever visited for maintenance. He peeked under his arm, leaning his hips against the opposing wall, and met Isaac’s upturned gaze below him.

“Was this route planned out *before* the time machine was built?”

“They were conceived of at the same time,” Isaac explained. “Rather than building an addition to the office space, which would have cost a considerable amount, they simply altered some of these maintenance corridors so that they connected to an airlock. You can’t blame them for sparing costs, since the crew consists of only two men. We’re almost there – keep climbing.”

After the cramped and dark experience on the ladders, which grew hotter and stuffier with each upward step, Alec felt as if he were emerging into fresh air for the first time when he pushed the last hatch upwards and pulled himself into the more open space of the time machine’s quarters. He moved to the side to let Isaac climb out and observed the surroundings. The surfaces, walls, floors, and ceilings, were for the most part white laminate, almost glaring compared to the gloom in which he had been previously climbing. Once his eyes adjusted, however, he realized that the space was not brightly lit, but softly illuminated by lights that were nestled in subtle, out of the way corners. There were two doors on opposite ends of the room. Next to the door on the left was a small common area: a square table with booth-like seats crowded around two sides. The door on the right was accompanied by what Alec could only assume was the ‘kitchen,’ for there was a glass paned machine that looked like some sort of oven, and lots of cabinets.

Isaac closed the hatch with a snap and twisted the air-lock engagement key before straightening his back with a groan. “The door next to the common area,” he said, pointing to the left, “leads to the toilet and our sleeping spaces. On the other side, the door leads to the computer room. And that’s it for our living spaces.”

Alec fingered a little slot low down in the wall and pulled out a rectangular section large enough for him to sit on, which he did. “It looks as if there are plenty of nooks for us to use. It’s small, but we’ll get by.”

“But it’s so plain,” Isaac said critically. He opened a cabinet (yet another unlabeled slot in the wall) and pulled out a pot full of dirt. “Which is why I made sure to sneak this in.” He pulled a small bulb attached to a clip from his pocket and attached it to the side of the pot. With the flip of a switch, it turned on with a sunny glow. “That is the only sunlight we’ll be seeing for the next two months.” He set the pot on the common table and turned towards the bedrooms. “Shall I give you the tour?”

Alec smiled. “I suppose it will be short enough.”

“The shortest,” Isaac promised, pulling the door open. This section of the crew quarters was a dusky blue color, and quite dimly lit; there was a narrow hallway with two doors on opposite sides and one door at the far end. “Far door is the toilet. We’re on limited water, so there are no liquid showers, but there is a dry powder you can use to clean yourself. Your drinking water supply is in your room (the one on the left) and that too is regulated. You’ll only be able to get so much from the tap in any given day.”

He shut the door and turned towards the computer room, which turned out to be the largest space, though it was mostly filled with equipment. There were two chairs that could turn in any direction, and several drawers full of equipment such as notebooks and ink pens, flashlights, batteries, and other odds and ends that Alec imagined would either never be used or be used up all at once.

Isaac gestured wordlessly at the room. “Well, that’s that, really.” He sat down in one of the chairs and Alec joined him as they began turning the machines on one by one.

“There are no windows,” Alec commented. “I suppose I had imagined at least one very small one.”

“We will be traveling fast enough that there is danger of irradiating the ship,” Isaac replied. “Space isn’t a perfect vacuum. However, we’re protected by an anti-matter shield that surrounds the ship, which will take care of that problem, as well as any particles of space material we will inevitably run into. But between the Time Distorters and the shield, there will be literally nothing to see – hence no need for windows.”

Alec didn’t know if it was worth asking: “An *anti-matter shield*?”

Isaac smiled. “Different department. I have no idea how it works. I have only been given assurance that it will prevent us from bursting into a terrible and fiery death. Is that satisfactory?”

Alec laughed. “It will have to be.”

Their departure was as uninspiring as Alec had predicted it would be. He felt the machine disengage from the offices and heard the cheers of the people left behind fade to silence as they moved out of radio contact. It chilled him to think that he would likely never see many of those same people ever again. The sensation of the machine accelerating was unusual. While they remained in the

Earth's atmosphere, there was the familiar pressure of resistance, but as they moved into open space that resistance lessened, as did the pressure, and the artificial gravity system seemed to also be combating the effects of their speed. He felt some excited tension as Isaac prepared to activate the Time Distorters, but other than an initial, slight jolt, there was no bizarre feeling to accompany their sudden disruption of space and time.

"Well Alec," Isaac said, leaning back in his chair. "Not only is our work finished for today, but we are not traveling through time."

"Just like that?" Alec asked sarcastically.

To which Isaac responded with his cold smile. "Just like that."

When Alec rolled off the edge of his cot the next morning and walked wearily into the common area, he was surprised to see that the pot had grown a small green stalk over night and was in the process of blooming into a sunny pink, bell-shaped flower. Isaac was sitting next to it with a book in front of him, and he pointed wordlessly to a tray of food to indicate that Alec should eat breakfast.

Alec sat down, eyeing the flower with distaste. It was very similar to the flowers that had sat on his bedside table in the hospital.

"I can see you glaring at the plant," Isaac said from over the top of his book. "Ignore it and eat your breakfast."

Alec's mouth twitched and he looked down at the tray. There were two small dishes that had been warmed up for him. Isaac had not removed the plastic covering their tops, and an unappetizing layer of condensation was gathering on the underside of each. Alec peeled the plastic away, limp and unwieldy with the heat, and took a hesitant sniff at the escaping steam.

"Hmm, frozen airplane food," Alec said jokingly.

"It certainly looks that way," Isaac said, sticking a finger in his book and laying it on the table in front of him. "But *that* is highly nutritious, unlike its doppelganger, and will keep you healthy while you spend the next two months in cramped quarters with no way to exercise."

Alec picked up the plastic fork sitting next to his meal and used it to point at each dish. "And what are they supposed to resemble?"

"Eggs, sausages, and potatoes." Isaac waggled his eyebrows. "Bon appetite." He returned to his book.

Alec took a few hearty bites of his food and decided that, despite the supposed nutritional value of the meals, he would likely lose weight. He glanced at Isaac, chewing resignedly, and wondered if his partner intended to read the trip away. "What's the book?"

Isaac let the book drop towards the table with an irritated smile. "Poetry."

Alec felt the urge to smile back with his mouth full of food and immediately repressed it. Isaac's unusual attitude was infectious, but Alec was

determined to emerge from the trip a mature adult still. Nevertheless, he was *also* determined to have some conversation from his partner, who he still barely knew, so he pressed on. “What *kind* of poetry?”

Isaac looked down at the page he was currently reading and recited aloud the poem that he had been returning to all morning: “We are helpless before time / Which ever speeds away. And pains of a hundred kinds / Pursue us one after another. This is the way of the world; / And, cling as I may to life, / I know no help!”

Alec blinked. “Cheerful.”

“Yamanoue Okura,” Isaac said.

“Do you think he’s right? That we’re helpless before time?”

Isaac sighed and finally returned his bookmark to the place where he had last finished. “I think anyone who would argue otherwise is a fool. We can create tools to manipulate time,” he indicated their surroundings, “but in the end, no one lives a moment past his expiration date. Time is an unforgiveable force. It cannot be changed. It is the only constant in the world. In fact, you could debate that time *is* fate.”

“So when you say you believe in fate,” Alec reasoned, “what you’re really saying is that you believe in time.”

Isaac considered this. “An oversimplification of the comparison, but I suppose I could accept that. Now stop asking me existential questions and finish your airplane food. We do have some work to do.”

That first day onboard established a routine that would not break for the rest of the journey. After Alec finished eating they spent several hours in the computer room, taking notes of their progress on paper in case there were some problem with the computer’s log, performing manual checks on the functionality of their machines, ensuring that the life systems were regulated and administering air, water, and food at the proper limits, as well as other menial tasks that Alec felt could have been performed by someone with a lower degree of learning than himself. It was when he ran through the checks on the telescope itself, riding above them with a force of several tons, that he felt like he had been brought along for a reason.

After they had completed their objectives in the computer room, they moved on to the second disappointing meal of the day, followed by any conversation that Alec could persuade Isaac to take part in. His limit of sociability, however, remained at no more than an hour, and the rest of his evening was usually spent reading. Alec took up several different activities to keep himself busy. After his first attempt ‘showering’ with the cleansing powder, he decided that it would be best to do it as little as possible. He took one of the notebooks from the computer room and practiced stimulating his memory again by writing anything that came to him, but day after day he ended with nothing but scientific



theories, meaningless doodles, and word-for-word records of conversations with Isaac. He started simple floor exercises, which Isaac would often put his book aside to watch lazily until Alec felt self-conscious enough to stop. And he also read the book that Isaac had lent him. Every time Alec burst out in indignation at the scientific improbability of one story or another, Isaac would smile and say, “Why read a book unless you can either be enlightened by it, or criticize it?”

After two weeks of the same, Alec decided one morning to just stay in bed through breakfast. It was his usual habit to get out of bed immediately upon waking up, since lying in bed was the activity for people who had things to contemplate, and the emptiness he felt when he tried to contemplate his life still disturbed him. This morning, however, he forced himself to lie awake, stare at the ceiling, and listen to the quiet hum of the machine. He thought of nothing.

He had not been there long when he heard a tapping at the door. “Alec?” Isaac’s muffled voice came curiously from the other side. “Are you awake yet?”

Alec rolled from the cot and opened the door with difficulty, since Isaac was standing on the other side. “Of course I’m awake.”

“What are you doing in here then?”

Alec felt a pinch of annoyance at such a bold question. One did not simply ask what another person did in their private spaces. But since his answer was not particularly exciting, he offered it anyway. “I was getting lost in my thoughts. Don’t tell me you were lonely.”

Isaac’s half-smile pulled at his face. “One does not have to constantly converse to enjoy another’s company. Have you tried meditating before?”

Alec finally gave up the possibility of getting back in bed and shut the door behind him, following Isaac into the common area. “My doctor had me try it once. It didn’t help.”

“That’s too bad,” Isaac said sincerely. “Though it is an excellent way to relax, if you find yourself getting sick of the space. Speaking of – we are now in range to collect data from NGC3603.”

“We are?” Alec asked, shocked. “I thought it would have taken longer than that.”

“It will take longer to collect all the data our computers can hold than it took us to get here,” Isaac said. “But, at the same time, now we will have more work to distract us. Automatic machines still need guidance.”

It was only as they entered the computer room that Alec noticed something was different about the noise the ship was making. “Has something shut down?” he asked, feeling a momentary flash of panic.

“Yes, but it is meant to,” Isaac reassured him. “The Time Disruptors have shut down for the duration of our data collection. We won’t be needing them, since we are merely orbiting the general area of the star cluster.”

“I wish we could see it,” Alec said. “Being this close and having to wait until we return to know what is going on out there is a most cruel irony.”

“As a wise man once said,” Isaac said, “you can’t always get what you want.”

By the time they were headed back to Earth, Alec was eager to have open spaces again, but apprehensive as well as to how much time had passed while they were gone. Would he recognize anyone at their reception, or would they all be strangers? If they had been traveling for too long, it would be the second time that Alec had lost his connection to the world.

He had been amazed when Isaac had told him that time travel was possible. He had boarded a machine that had taken him into deep space without any hesitation. Put together, he had experienced something that few other people in all of human history would get to do.

But for him, the summary of his experience as a pan-galactic time traveler had been being squashed into a white box for two months.

When he presented his thoughts to Isaac, his partner nodded in agreement. “Science is not often as romantic as people make it out to be. It creates incredible things, but to get there takes a lot of hard work that is rarely as exciting as the end result. When you hear about Galileo, you’re being told about the mountains on the moon and not the months he spent grinding his own telescopic lenses. The one good thing about my time machine is that it will never be used for recreational travel.”

They were a few days away from their destination when Alec pointed out that the flower had wilted and died. Isaac seemed surprised, but also unphased by the failure of his botanical project. Clearly he had forgotten about the plant for quite some time. “It served its purpose,” he said simply.

Sitting in the computer room, waiting for their machine to come into radio range, Alec felt a surge of horror – what if there was no one to greet them? What if they had accidentally been gone so long that all of humanity had died out long ago?

He glanced at Isaac, who had rested his chin in the palm of one hand and was staring into space absently, clearly bored. He chided himself for being so dramatic and resolved not to read science fiction on his next trip out.

But the fear that they were alone stuck with him until the radio began to crackle and a voice requested them to begin docking sequence three.

“Home again, home again,” Isaac quipped as he pressed the appropriate buttons on the control panel.

They opened the air-lock hatch in the common space and descended the ladder to find, much to their surprise, that the series of maintenance ladders which

they had ascended three months before had been replaced with a single room and an elevator, which they boarded without hesitation.

“Which floor do you suppose everyone will be waiting for us on?” Isaac asked, wiggling his fingers over the numbered buttons.

“Well, which floor did they see us off on?” Alec asked.

Isaac thought hard for a second, then pressed the number six. “I need to go to my office anyway and pick up some different books.”

When the elevator doors whisked open, sure enough there was a crowd waiting, though a much smaller one than that which had seen them off. At the front was a woman in a smart business suit, and she was looking at her watch impatiently. As Isaac and Alec stepped forward, she looked up at them, and Alec immediately recognized her eyes.

“Hail the conquering space cadets,” said the woman slyly. “Tall, dark, handsome – they’ll be making movies about you within the month.”

“I highly doubt that, Ms. Jacobs,” Isaac scolded with good humor. “No one even knows we exist.” Isaac seemed thrilled at the anonymity. Alec felt his stomach twist.

“That’s *Dr. Jacobs* now,” Elly replied, holding her hand out for Isaac to shake. “Not that you’ll use it, if what I remember about you is still true. And I wouldn’t be so sure about that secrecy. Your mission being a success, it’s only a matter of time before the director decides to involve the press at last.”

“I don’t see why he should,” Isaac snapped crossly.

“Well, he’s waited a long time for the fruits of your labors, Isaac. You took your time getting back.”

“Ah yes, do tell,” Isaac said eagerly. “How did we do? Not too badly, since you’re still here, and running the show as I predicted.”

“Thirteen years and some spare months. It’s almost December down on Earth. Your safe arrival is like Christmas for those of us who are still around...and not so much for others.” There was a sadistic glint to her eyes. “Dr. Leeds will be most pleased to see you.”

“Ah,” Isaac said shortly. “He may be catching up in age, but he’s not catching up in brains any time soon. He is the first on my list of people to visit.” Isaac paused, before rushing off, and stepped closer to Elly. “Um...I suppose...considering your current position, that Dr. McMillan has retired.”

Elly’s smile faltered slightly. “He retired about five years ago now, and passed away quietly in his hometown. You were mentioned at the service.”

“Right,” Isaac said softly, and a new menace entered his shoulders. “I’ll be off then.”

He whisked away just in time for one of the awaiting party members to step forward, protesting, “Dr. Venn, please, a moment!”

“Alec, could you please answer any and all question?” Isaac called back without turning around.

Alec looked at the man who had stepped forward and cleared his throat. “Can I be of assistance?”

“Yes, yes of course,” the man replied. “I am the company doctor, and I mean that medically...most of us are doctors here.” He chuckled, and Alec wondered how many times he got a laugh out of that joke. “My name is Dr. Kell. I was hoping to be able to perform a physical examination on one of you fine gentlemen. After all, we do not know how time travel affects the body just yet, and we need to make sure you and Dr. Venn are not taking any unknown risks before you return to space.”

Alec was not aware he was frowning, but he did hear his own voice answer a lot more hotly than he would have liked: “I feel fine.”

“Nevertheless, Dr. Savitt,” Elly interrupted. “If you would kindly accompany Dr. Kell, I would also appreciate it.” She fixed him with a pointed stare of authority.

Alec could not help but smile weakly. “The last time I saw you, you were an intern. This time travel thing will take some getting used to.”

Elly’s face cracked into a smile as well. “Yes. Now *I* get to boss you around. I can’t wait to use that privilege on dear Dr. Venn. Speaking of him, I have to track him down before he gets too wrapped up in gloating.” She turned on her heel and left Alec with Dr. Kell.

Isaac burst through the door of the Department of Paradoxy with so much enthusiasm that he knocked several piles of paper flying onto the floor. “HAH!” he shouted, and if there had been a single individual in the office who had not been startled before, they jumped now at the laugh.

“You *see*??” Isaac crowed. “Here we all are, still safe and sound. Has the world dissolved? *No*. Has humanity turned into tiny protozoan squids? *NO*. Are your grandfathers still in good health? *I should hope that if they aren’t, you had nothing to do with it.*”

A dead silence fell over the room as Isaac paused to relish in the effect of his words. At the back of the room, a young man, likely the newest intern, whose mouth was hanging open in shock, let his pencil drop from numb fingers with a loud crack that seemed to awaken the Department members back into action.

“Dr. Leeds is not currently in the office,” one man snarled, “if that is who you are looking for.”

“Oh, I’m not discriminating in my scorn,” Isaac said jovially. “This entire department can now safely cease to exist!”

“*That remains to be seen,*” a voice behind Isaac said icily.

Isaac turned around to see Tim Leeds standing with a clipboard gripped so tightly that his knuckles were turning white. “Well, well!” he cried. “Don’t tell me – you’re now in charge of this waste of funding?” He gestured to the office behind him, where several sour looks were turning deadly.

“Boasting does not become you, Isaac,” Leeds snapped as he pushed past him into the office. “It never has, though you seem to prefer it as your best color.” He bit his words off as if they could turn to bullets. “Yes, you have arrived safely home, but do not think for a second that that makes our world safe. The fabric of space and time can handle your shenanigans, that is clear. We will see if the *Earth can*.”

“Oh do indulge me, I beg of you,” Isaac said, laughing. “What foolish lies have you come up with now?”

“Our company is not the only one to have secured materials that could be used to make a time machine, Isaac,” Leeds pointed out, putting his clipboard down on a desk and facing his rival with hands balled into fists. “It took you eight years to come up with the technology, but you’ve been gone for thirteen, and I would not bet any money on you being the cleverest scientist to come up with a bizarre machine. Others will follow, and their pursuits will not be so academically minded. War is coming. Time war.”

Isaac stood with his mouth hanging open in a cheshire-esque grin for several suspended seconds before he burst into more laughter. “War. War? You must be joking.”

“Yes, Isaac. *War*. If time technology like yours develops and gets into the wrong hands there is nothing that could stop any government from returning to the past and destroying their enemies before they even become a power to be reckoned with. I’m talking about genocide on a massive scale. H-bombs dropped three hundred years before their invention; mustard gas and machine gun in the middle ages. Your pathetic little field trip could turn the entire planet black with vicious war.” Leeds looked triumphant as he ended his speech, and the scientists surrounding him stood up taller, glaring at Isaac as if he had dropped the bombs himself already.

“Oh I can’t even look at you, Leeds,” Isaac said, shaking his head sympathetically. “The past is unchangeable. You can go back as far as you please, but you won’t shift a single pebble.” With that, he turned away and slammed the door shut behind him.

“Seems like I missed your big showdown,” Elly said as she caught up with Isaac outside his office. “But I managed to catch a glimpse of Dr. Leeds, and he looked like he’d swallowed a cactus.”

“He’s an eloquent fool, but a fool nonetheless,” Isaac said. “He would do better as a politician than a scientist.”

“Oh for the love of God,” Elly said desperately. “Don’t give him that idea. While he’s behind those doors, at least he can’t do any real harm. But I didn’t come to talk to you about Dr. Leeds, I came to talk to you about Dr. Savitt.”

“Shouldn’t we be discussing the mountains of data that are just waiting to be harvested from my ship?” Isaac asked. “We just got back from an expedition recording the current state of one of the most exciting locations of star birth in the galaxy – what are you wanting to talk about Alec for?”

“The two subjects are linked,” Elly said sadly. “The director found some of Dr. Savitt’s published works and thinks he’s brilliant.”

“Well, good for the director. I *told* him that Alec was brilliant decades ago.”

“Yes. But now the director wants Dr. Savitt’s brilliance to be used *here*.”

Isaac froze and put the book he had taken off of his shelf down very slowly. “Here. What do you mean...here?”

“I mean here in the offices, Dr. Venn,” Elly said. “Dr. Savitt won’t be going with you on your next trip.”

### “The Consequences of Fate”

Normally, Dr. Venn would have just entered the director’s office without knocking, seated himself in the chair opposite to his desk, and immediately gotten to the point of what he wanted. The director had enjoyed thirteen years of peace and quiet without the enthusiastic metaphysicist, yet since he knew that Venn and Savitt had returned, it was only a matter of time before Venn’s opinions were made known.

So when there was a polite but very firm knock on the door, the director knew that Dr. Venn was cross.

The director had been in his early forties when the time machine first set out into space. Now securely middle-aged, he was spending less and less time in the ionospheric offices and more time in the luxury of natural gravity and unprocessed air. Any time he spent in the atmosphere was time he loathed, and so it put him in no mood to deal with Dr. Venn’s irritation.

“Come in,” the director called wearily, and Isaac let himself in quietly and calmly, folding himself into the chair with much more formality than normal. “Welcome back, Dr. Venn,” the director said. “And how was your first trip?”

“Just fine, director, thank you,” Isaac said coolly. “The machine worked flawlessly and we suffered no ill effects from travel.”

“I understand that Dr. Savitt is being examined as we speak for any ill effects. I would not jump to conclusions, Dr. Venn.”

“Then let me rephrase,” Isaac said. “It is unlikely in the extreme that we suffered any ill effects from the travel, and if we did, none have obvious symptoms.”

“Very well,” said the director. “Well, I appreciate your hard work on this most momentous of occasions, and look forward to seeing the data once it has been properly deciphered. Now what can I do for you? If you keep it to yourself much longer you might explode.”

The corner of Isaac’s lip twitched as he leaned forward in his chair. “I hear through the grapevine that you will be ordering Dr. Savitt to remain behind for the next mission.”

“Dr. Jacobs hardly qualifies as ‘the grapevine,’ Dr. Venn, especially as she is now your superior. And we can scarcely spare Dr. Savitt’s mind to be engaged in crossword puzzles whilst you fly through space monitoring machines. A lesser scientist than he can do all that is required on that ship, and we can use all the brilliant astrophysicists we can in the coming years.”

“Has hiring been tough?” Isaac asked, bitterly sarcastic.

The director’s eyes narrowed. “There are other, more exciting projects than ours happening all over the country. This project is important to *you* and to those of us who started it, but getting young blood to join us for a goal they may

not live to see fulfilled is a hard sale. You made good time this trip, but I believe it was the original plan to continue traveling further afield on each consecutive trip. By the next time you return, anyone joining the team now will be cashing in their 401k.”

“I must insist that Dr. Savitt remain assigned to monitoring the time machine,” Isaac said stiffly.

“Why?” the director countered, his voice rising. “You are not seriously prepared to deny that his talents are not heinously *wasted* in that machine of yours? You designed it too well, you and the technicians who put together the telescope upon which it functions. It barely needs *your* supervision, either, but I let you ride around in it because it is *your* invention. If anyone should have to deal with the consequences of its failure, it should be you. On the other hand, Dr. Savitt is not so easily spared.”

Isaac glanced down at his hand, resting on the arm of the chair, and noticed it was trembling slightly. He balled it into a fist and brought it up the rest against his chin. “I need a proper astronomer on board. And if you tell Dr. Savitt to stay behind now, you will be sentencing him to death.”

The director now had had enough. “Oh, don’t try and trap me with drama, Dr. Venn. Dead to *you*, perhaps. You come and go like some ageless god, while the rest of us grow old and watch the entire project slip through our fingers and into the hands of the next generation. The point is, the project takes precedence over any of our personal feelings, including yours. If you truly need an astronomer, then you can take one of the interns, if they will agree to go. Every single one is qualified to do what that machine requires.”

“You will not convince anyone other than Dr. Savitt to go with me and you know it,” Isaac hissed. “You are not aiding the project you are crippling it.”

“I am heading down Earth-side this afternoon, Dr. Venn,” the director said. “And I will not be returning to see you off. My decision in this matter is final. If we must wait for another astronomer who is willing to travel through time to come along, then I am more than willing to wait for him. After all, for everyone on the team but you, Dr. Venn, this has been all about waiting.” And he concluded the conversation by pointing harshly to the door.

Isaac stood and spun around, fury lining every movement. But he did not slam the door on his way out, and because the director had expected him to do so, his self-control made him even angrier.

Elly Jacobs sat patiently in Isaac’s office as he paced furiously back and forth, restraining himself with all of his will power to not begin throwing things.

“God *damn* him!” Isaac shouted as loudly as he could. He slammed his palm flat on his desk and sat down heavily in his chair. “*Damn him to hell!*”

“You honestly did not see this coming?” Elly asked quietly.



Isaac looked up at her with a withering glare. “I was too busy reveling in the ingenuity of man kind’s triumph. I cannot predict the stupidity of my superiors all the time. That takes up too much of my brain power.” He put his head in his hands and was quiet for a moment, then lashed out at the disarray of his desk, sending papers and books flying to the side and onto the floor.

“The machine is being restocked as we speak,” Elly said. “Do you have a destination yet?”

“Don’t talk to me about having a destination, Elly, when I don’t even have a full crew. They’ve taken away my rudder and still expect me to sail?”

“They haven’t taken away anything,” Elly said calmly. “The director has made an order he can’t hope to back up. He’s going Earth-side this very day; how do you expect him to ensure that Dr. Savitt does not make it on your machine.”

Isaac sat back in his chair and observed Elly very carefully. “What are you saying?”

“The director is right in that this project is more important than any of our personal feelings or priorities. That includes some of the director’s decisions. Dr. Savitt is a brilliant man, but we don’t need him on the analysis team. We have plenty of equally brilliant astronomers already, no matter what the director says. And frankly, catching Dr. Savitt up on the new technology that has developed in the last thirteen years would waste more time than if he were to accompany you. And if he doesn’t accompany you, then we have to wait indefinitely for another willing participant to come along, and one may never come. You and Dr. Savitt seem to be the only people I know who are willing to let the world pass them by for the sake of science.”

Isaac stared at Elly. “You are telling me that you are willing to countermand the director’s order and risk your own position so that this project can continue?”

“Like I said,” Elly said simply. “This project is more important than any of our personal feelings. I will not live to see you get back the next time anyway, and I can get work anywhere. I’m not worried about being fired, and the director knows this. Besides...” she smiled quietly. “He can’t spare me either.”

Isaac covered his face with his hands, his body melting with relief.

“This isn’t just about completing the project, is it, though?” Elly asked suddenly. “You want Dr. Savitt along for other reasons, don’t you?”

Isaac let his hands drop, and Elly saw a deep weariness in his face, as if he had been grieving. “I am willing to let the world pass my by for science, Elly, because science is all I have ever had. It is impossible to make bonds with people who have attachments. Alec is the only person I have ever met to understand that.”

“You consider him your friend.”

“I do.”

Elly smiled. “The machine is being stocked well – likely overstocked, but the performance of the engines will not be affected by the extra weight, and we do not know how long you will be away. The destination lies at your discretion, Dr. Venn. Just please let me know what it is before you leave?”

Alec left the company doctor’s office disgruntled and feeling extremely uncharitable towards his partner. If he had never been through another examination after his release from the hospital, it would have been too soon. Technically it had been thirteen years, but it only felt like a matter of months. The similarities between being in a coma and traveling through time struck Alec. In both situations you became dead to the world.

In his hands he held the bundle of clothing that he had left behind on the day of their departure. The company had stored his few belongings for his return, and Alec was eager to change out of his jumpsuit. It had never been washed for their entire journey, and though the material had never seemed to get dirty, Alec was looking forward to a different texture.

As he walked down the hallway to look for an empty personal closet, he unfolded his shirt and shook it out, hoping that the creases would flatten out when he put it on. As he did so, a small, folded piece of paper fell to the floor.

Alec bent to pick it up, curious. As soon as he had grasped it in his fingers, though, he remembered what it was. The bottom of his stomach dropped, and he stood up slowly, unfolding it with trembling hands.

The words at the top, Dear Rachel and Tom, confirmed his dread. It was the letter that he had meant to send his parents. A three month mistake on his part was thirteen years of ignorance for them. Were they even still alive? If not, they had died never hearing from their son again.

He placed his back on the wall and slid down to sit on the floor, burying his face in the bundle of clothes he held. It would have been the least he could have done to let them know he was alright. Now that it was too late, he felt like he could have done so much more for his own parents, whether he remembered them or not.

The sound of brisk footsteps were approaching, but Alec did not raise his head. He hoped they would just pass him by, but as they rounded the corner, they slowed perceptively until they stopped next to him.

Isaac sat down on the floor with Alec, glancing at the paper he still held between his trembling fingers. His partner’s shoulders were shaking as well. Isaac had not had many relationships in his life, but he knew when to leave a man alone.

They sat there in silence for several minutes before Alec at last raised his face and lifted the paper for Isaac to take. He did so silently, unfolded it and read it quickly.

“I’m sorry,” he said gently. “Time separates us from all things.”

“No, I did this,” Alec said hoarsely. “I could have done more. I *should* have done more.”

Isaac opened his mouth, but closed it again helplessly. He had the feeling that Alec would not appreciate the only comfort he could give. So he sat there, quietly, and waited.

After a while, Alec cleared his throat and turned to look at his partner. “So, where to next?”

Isaac glanced at Alec, and then back at the piece of paper. “Are you sure you do not want to—”

“No,” Alec immediately replied. “No, I’ve done enough damage. I can’t imagine how reaching out to them now would help, if they even are alive. And if they’re not....I don’t want to know that for certain.”

Isaac’s mouth thinned, but he didn’t say anything. “30 Doradus,” he replied briskly. “This time we’re branching out to another galaxy. It’s in the Large Magellanic Cloud, one of our galaxy’s satellites. Forty-nine kiloparsecs away.”

Alec looked over at him. “That’s quite a leap in length from our last journey, isn’t it?”

Isaac smiled. “There’s no time like the present. Why, did you have somewhere to be?”

Alec smiled back, but sadly. “No. No, I absolutely did not.”

There was no crowd to see them off this time, and Isaac suspected that no one but team members of Elly’s choice had been informed that they were leaving at all. She alone saw them off at the elevator that would take them to the time machine.

“I will most certainly be long dead by the time you get back,” she said as the elevator doors opened. “But you can be certain that I will set up a proper legacy of research. You needn’t worry about your return. In fact, I almost wish I could go with you this time, if only to see what the future will be like.”

“Time’s the king of men” Isaac quoted. “He’s both their parent, and he is their grave. And gives them what he will, not what they crave.”

Elly laughed. “And what is that supposed to mean?”

“Well, Shakespeare was no metaphysicist,” Isaac replied. “But I have the feeling he understood that knowing what the future will bring is not always a blessing. Nevertheless, I have high hopes for our return, and look forward to it as well.” He stepped forward and shook Elly’s hand with a smile. “It’s been a pleasure, Dr. Jacobs. I wish you all the best, and good luck wrangling the director.”

“Never fear about him,” Elly said with a wink. She turned to Alec and also shook his hand. “Goodbye, Dr. Savitt. I hope you find what you are looking for.”

“Goodbye, Dr. Jacobs,” Alec said. “I’m not sure I’ll know it even if I do.”

As the doors closed, and the elevator began to rise, Isaac glanced curiously at Alec. “What did she mean by that?”

Alec shook his head and looked at the hand that had only moments before been held by Elly Jacobs. “I don’t know. I wasn’t aware that I was looking for something.”

Their journey was practically identical to the one before it, only this time Alec did not attempt to pull Isaac out of his shell for idle conversation. He was too busy lost in his own self-inspection. Elly’s parting words had struck him as significant, though he didn’t know why. Was he looking for something? He didn’t feel like he was – if anything, he had had more of a guarantee in the past than he did in the possible future. He had left behind a family that loved him, but what had he traded it for?

He was sitting in the computer room, thinking just that thought, when he suddenly turned to Isaac and asked, “What are you looking for in the future?”

Isaac, who had been lost in his silent work for two hours, was startled by the sudden question, and dropped the notebook he had been writing in. “What?” He leaned down to pick up the book. “What am I looking for?”

“Yes,” Alec said. “I can’t get Elly out of my head. She said, ‘I hope you find what you’re looking for.’ But I’m not looking for anything. I left everything I had behind in 2049.”

Isaac leaned back in his chair and pursed his lips. “So what you’re really asking is why I left too? Or, rather, why I was willing to leave where others were not.”

Alec nodded.

Isaac closed his eyes and thought. “I suppose it was because I never had any strong ties to the present. As a young man, the only thing I had was my work and the brilliance to back it up. Being so smart that young doesn’t earn you any friends or favors. When time travel fell into my lap, which is essentially what it did, what was stopping me? There was nothing for me in the past, even if I had believed that I could change my life, which I didn’t. And, in the present, still all I had was my work.” He shook his head. “I suppose I never really thought about it, but I’m looking for something else in life than relativity equations and logic puzzles and time-like loops. I’m just not willing to wait for my future like everyone else.”

“Isn’t that a bit impossible? Once you get to the future, it will be the present.”

“Relatively, for everyone of that era, yes. But we will be leaping past hundreds of years of human history. Even if we learn all that has happened, and blend in like a ‘present’ human being, we will forever be from an era that has passed. You can get a glimpse of what I’m talking about by spending five minutes

with a centenarian. They see the world through eyes that have seen generations that no longer exist. We will be the same, but still young.”

“And what makes you think you can blend in when you’re making yourself so fundamentally different from everyone in the present?” Alec asked suddenly. “When will you decide that the present is your future? When will you stop?”

Isaac looked startled at the question. “Perhaps never,” he admitted. “Perhaps this machine will cease to function when I run out of time to move through.” His voice lowered into barely a murmur. “When you are presented with a one way road, and the oasis at the end of that barren wasteland is likely a mirage, do you stop and decide that the desert is good enough? These are the consequences of fate, Alec. You can’t change anything about it, you just...” he waved his hands aimlessly, “move through it as best you can.”

It had taken them three months to make the round trip to NGC3603. The trip to and from 30 Doradus took twice as long. After a while, Alec finally got used to the static in his brain; it matched so well with the silence of the void pressing in on the walls around him that he gave up the discomfort and learned to sit and think of silence. Hours would pass without a word between him and Isaac; and then other times the walls would echo eerily when one of them made the other laugh, or when they debated through difficult scientific theories. Most of the time, however, the silence was too heavy to make the effort to lift it.

“I think you’re the only person I can get along with, Alec,” Isaac once admitted briefly.

“Why do you say that?” Alec asked curiously and a little embarrassed.

“No one else in all my life has been able to bear my silence. We go for hours without saying a word, yet you don’t seem to mind.”

Alec shrugged. “I *don’t* mind. If there is nothing to say, then there is no need to say anything. I’m not sure if I was that way before my accident, but ever since I woke up, I have had little to talk about. Losing your memories does limit the topics of conversation you can engage in.”

Isaac smiled. “So it must.”

And so they passed the trip in contented quiet.

Elly sat staring across her desk at Tim Leeds, wondering if she had heard him correctly.

“You seem to be under the impression that I am not being serious,” he said coldly.

“Not at all, Dr. Leeds,” she replied, her hands clasped before her. “I was under the impression that you were entirely serious. All the same, I must ask you to reconsider.”

“It has been ten years since Dr. Venn and Dr. Savitt set out last. I think it is time to start preparing for their arrival.”

“And you think that by resigning you will be preparing for them? I’m not following your logic, Dr. Leeds.”

“Then let me explain it to you,” he said charitably. “I am resigning, not retiring. The Department of Paradox here will continue its work, though to be frank there isn’t much left for it to do. We have established our theories, have collected enough evidence to back them up, and it is time for the people of the world to know what exactly they are being threatened by.”

Elly frowned. “Don’t tell me you’re going into the public service, Dr. Leeds.”

“That is precisely what I am doing, Dr. Jacobs,” he said, his eyes similarly narrowing. “Time travel is public knowledge already. I will not be damaging the secrecy of Maudlin & Smith. But do not think that this company’s reputation will survive the truth that I intend to reveal, either.”

“Is that a threat, Dr. Leeds?”

“I make no threats. Only promises. And I am not promising that any harm will come to this laboratory. I predict, however, that the people, once they have understood the threat that Dr. Venn has so flippantly introduced to the world, will take no small measures to prevent that threat from ever becoming manifested into reality.”

Elly sat back in her chair and sighed with frustration. “Well, there are no measures I can take to stop you Dr. Leeds, other than my own skills at persuasion, which I will not even bother trying to employ. I suppose you have the proper paperwork already in hand?” She glanced pointedly at the envelope in Leeds’ lap.

The corner of his mouth twitched and he lifted the envelope towards Elly’s outstretched hand. “Most perceptive, Dr. Jacobs.” He stood and walked towards the door, but paused with his hand on the knob to turn back and smile sadistically. “I do hope that the coming years are good to you, director,” he said. “It would not be my wish that the work I have in hand should cause you any displeasure, although, I cannot see how it can do otherwise.”

Elly did not open the envelope for a long time after he left. She had never taken Leeds seriously before, but now he was a truly serious problem. She had the sinking feeling that very soon everyone else in the nation would be taking him seriously too.

He had the gift of eloquence, and it won the people’s ear. Even those who did not believe in his logic felt drawn to his ideas. The names Venn and Savitt had been familiar in every household for years now, but they had never become heroes; how could they, when they had been gone for over ten years? The initial excitement of time travel had been quickly subdued by a shared question: why

hadn't the people been involved? When Neil Armstrong had walked on the moon, the entire nation had been watching. When Gregory Sims orbited the sun, they had been informed every step of the way. When Taylor Jones set foot on Mars, his words too went down in history. The first spark of amazement that the announcement of time travel has created was not nourished into a flame, but allowed to dim into disgruntled embers. As more time went on, the people began to resent the idea of time travel. "Where are they now, hm?" was the muttered question that many people wanted to know.

So when Timothy Leeds approached the pulpit with his passion, persuasion, and a case against that which humanity had been resenting for a decade, they were ready to listen. And they listened with growing dread and eventually a level of hysteria that drove them into his open arms.

"Are we approaching Earth now?" Alec asked, scratching at the beard he had resigned to grow. He kept it short, but after the first few months of shaving with as little water as possible, he had at last given up.

"Yes, but there's no noise on the radio yet," Isaac responded. "It's a little strange that there isn't any initial contact...but we could be too far out still."

Alec sat down next to Isaac in the dim light of the computer room and waited quietly with him. Several minutes passed by and there was no noise.

Isaac checked their progress into the atmosphere. "We're too close to the offices now for them not to have made some noise." His voice was concerned, though his face betrayed none of it. He reached down and held the radio contact button. "MS 27, this is Dr. Isaac Venn returning from 30 Doradus and intending to dock." He waited for a response, and glanced at Alec in confusion when there was still no response. The message was repeated, as was the silence.

Isaac leaned back in his chair, truly disturbed. "I honestly did not prepare for something like this," he said quietly.

"Could not just dock without them?" Alec asked. "It is automatic, after all."

"Yes," Isaac murmured. "But I'm not quite sure what we will be docking with. The computer says there is a port, and it says it identifies the station as our space offices...but why then would they not be answering?"

"Perhaps it has been long enough that they've forgotten about us?" Alec suggested.

Isaac did not answer.

They let the dock sequence occur and opened the hatch warily. The air that rushed up at them was fresh, but there were no lights, and the darkness in the hallway below seemed to diminish even the lights of their own ship.

"Another good sign," Isaac said sarcastically, fetching a flashlight from the computer room and shining it down into the hall. Everything looked abnormal in the wavering light as they descended the ladder.

Isaac pointed his light at the elevator control panel and pushed one of the buttons. Nothing happened. “Well, this area of the station seems to be out of power. Or the power is off, which is more likely since the life support systems are clearly still working. We have gravity and air, but no electricity...”

“Do you think the maintenance ladders are still reachable?” Alec suggested. They searched the corners of the room, looking for any break in the surface of the floors or walls, and found a small, removable tile that pulled away from a hole barely wide enough for either of them to fit through. After uncomfortably prying himself back out of the hole after a cursory look, Isaac nodded gratefully. “That does lead to the maintenance corridors, and I could see a ladder some distance in, but it’s a tricky tangle of metal and we will have to climb with our flashlights.”

“We don’t seem to have any other choice,” Alec said.

Isaac shrugged agreement and turned to struggle through the opening again.

“Isaac,” Alec stopped him with hesitation. “What if the station is abandoned?”

“We will have to see if we can get the atmospheric elevator working again,” Isaac suggested, “and attempt to descend to Earth.”

It took them an hour to navigate the ladder system in the dark, and they emerged into the open hallway gasping with effort and nerves, their jumpsuits stifling their exertions. Isaac stripped his suit off to the waist and used the sleeves as a belt, tugging on the front of his sweat-soaked undershirt to try and cool off.

The darkness in the station was total, and the beams of their flashlights made hardly a dent against it. “We should try and find the director’s office,” Isaac said, his breathing regulating at last. “Perhaps we’ll find some clues as to what year it is and what happened to the lab.”

They moved through the hallways slowly, opening office doors and glancing in as if they hoped that one door would open and light and sound would spill out of it. But every office was empty, cleaned like the day it had first been made. The equipment and furnishings had been stripped from the rooms, but nothing had been done violently. Everyone had just packed up and left.

After a few accidental wrong turns in the dark, they finally found the office that had once belonged to the director. It was the only door with a nameplate still attached, and as Alec centered his beam of light on it, the metal glinted.

“Dr. Elly Jacobs,” Isaac said with a hint of nostalgia in his voice. “The last director of the Maudlin & Smith Astro-Metaphysical Lab.”

“She didn’t seem like the kind of person to drive a company into the ground,” Alec said skeptically. He was now looking over his shoulder frequently as the echoes of their own movement rang in his ears threateningly.



“No,” Isaac agreed, his voice low in anticipation as he opened the door. “No, she wasn’t.”

There was a computer on the desk, on which a blinking light flashed faintly. Isaac approached the desk slowly and suspiciously, looking back at Alec to catch his reaction.

“Why would they take everything but the director’s computer?” Alec whispered.

“They cleared out,” Isaac said slowly, “but Elly would have planned for our return.” He leaned over the computer and pressed the power button. After a pregnant pause, it flashed into life, temporarily blinding them before their eyes adjusted to the glow of the screen.

A cursor appeared and began to blink in time with the little bulb at the side of the computer.

“Do you suppose it needs a password?” Alec asked.

“Unlikely,” Isaac said, letting his hands hover over the keyboard hesitantly. “I think it needs a command. Let’s try this...” *Power on.*

There was a deep clicking sound somewhere in the station, followed by a hum that grew louder until the lights at last flickered on. Alec squinted for a moment, then opened the door and glanced out into the halls. “The lights are on out here too.” Being able to see the emptiness clearly, however, was not any more comforting.

Isaac typed a second command: *Current Date and Time*. The computer responded with text of its own: *January 28, 2345*.

Isaac whistled. “We’re very late indeed.”

Alec walked over to stand over Isaac’s shoulder and blanched. “Did you predict it would take us that long?”

“My guesstimate was a large margin into which that number could fall,” Isaac said. “But I did not honestly expect to hit the far side of that margin.” He frowned. “If Elly was the last director, that means this place has been empty for at least two centuries...” The sound of his typing was loud and insistent, and again Alec felt like they were being stalked. He walked to the door and locked it.

*Check Messages...*

*...1 Message. Playback, Y/N?*

*Y...*

*...Initiating Message...*

Elly’s face popped up on the screen, a mirror image of what she would have looked like if she had been sitting where Isaac now stood. She had aged perceptively, but she was still beautiful, a well established woman nearing the end of her middle years.

“The only person who could be watching this is either Isaac Venn or Alec Savitt,” she spoke matter-of-factly. “I hope to God it’s the both of you at once. As

you no doubt have noticed, you will not be receiving a welcoming home party of the kind you expected. I apologize that I was unable to hold up my end of the bargain when I said I would create a proper legacy for you. But my own legacy has been taken entirely out of my hands.

“You see, in another twelve hours or so, I expect to be arrested.

“You can spare me your pity, since by the time you get this message I will have been dead for decades at the least. I don’t know what will happen to me, but I intend to go down fighting, and you deserve to know what might be coming your way.”

Alec and Isaac stared at the screen in silent horror, as if by not blinking they could bring that face out of the computer and into the flesh.

“About ten years after you left, Timothy Leeds resigned his position as the head of the Department of Paradoxy. He took what research he had, which was not much, and headed straight for Washington with the determination to destroy you, Isaac. I fear your insult, all those years ago, that he would be a better politician than a scientist, turned out to be quite prophetic.

“By that time, the American people had developed a certain amount of ill will towards the theoretical-science community. It’s hard to say how these sorts of situations develop, since they happen over time and with great subtlety. But nonetheless, Leeds found himself in the perfect political situation to get their attention. And by that time they were ready to listen to a flesh and blood man over a legend.

“Perhaps you were familiar with his ideas, but in the case that he kept them from you, I will explain them anyway. Leeds always believed that time travel to the past meant that the past could be changed. And the fact that there is no proof but logic against that belief gave him the advantage of persuasion. He began a crude series of one-sided debates, where he presented his theories that time travel could be attained by enemies of the nation who would then travel into our distant past and destroy our ancestors, wiping out the country before it was even born. Leeds believed that this could be used on any nation, of course, but his tactics were fear-based, and to instill fear into the American people meant that he had to turn them into targets. He presented your side as well in his debates, but he made no attempt to present them flatteringly. Needless to say, he won the people. And the people, at the time, still ruled.

“Time travel was made illegal, as well as all research and development that could be classified as being anywhere near the classification of temporal metaphysics. We were compelled to shut down our program, but those cuts were only the beginning. Leeds was a hero by this point – more than a hero, he was a savior. The people wanted him in charge of more, and he gladly accepted the roles they threw at him.

“The political situation has, predictably, declined ever since, and one by one the areas of our laboratory have fallen under persecution until we have been compelled to shut down entirely. Some of the scientists who served on your team have already been arrested. We have been forbidden from dismantling the ionospheric offices, however, and I suspect that is because Leeds still hopes to catch you coming back some day.

“I don’t know how bad things will have gotten by the time you arrive. Perhaps you will be lucky enough that this will all have died down. But until you have proof of that, you must assume that you are both wanted men who will be arrested on sight, and that if you are watching this, then you are being watched, and that they are already on their way.”

She smiled very sadly, and there was a tear in her eye that she bravely ignored. “I am so sorry that we failed you here. I can’t imagine that this was what either of you were looking for.”

*Message End. Repeat?...*

Isaac let his face fall into his hands and he rubbed it wearily. “Dear God,” he said so softly that Alec could barely hear him.

They both stood in silent shock, staring at the prompting computer screen.

Isaac suddenly seemed to have an idea, and he again leaned over the computer.

*Atmospheric Elevator: Status?*

*...Analyzing...*

*...Atmospheric Elevator: Working and In Route...*

“Well,” he said coldly. “That answers that question. Elly was right. This whole office complex was preserved as a booby trap for our return. They’re on their way right now.”

“How long does that give us?” Alec asked desperately.

“After this long, likely with very minimal maintenance work, I’m amazed it’s still functioning at all. I would guess no more than six hours. But what exactly do you expect to do?”

“Think of something other than sitting here and waiting to be carted off to jail,” Alec said. “That was my first thought, at least.”

“Fair enough,” Isaac said wearily. The steady stream of bad news seemed to have temporarily defeated him.

“What if we made it to Earth without being caught?” Alec asked suddenly.

Isaac glanced over at him. “There’s no certainty that there is an elevator pod docked on the office already.”

“But if there is, do you think we could make it down?”

“Well, you saw for yourself that there are no windows – but the holograms would let them know that we were descending. Then again, you can’t reverse the

route of a pod once you've started a course. They would have to wait until they reached the top to turn around and collect us. If they weren't able to notify others about our descent, and *if* we were very lucky, maybe we could make it. But what do you intend to do on Earth once you get there?"

Alec gestured at the computer, and Isaac moved aside willingly.

*...Command Prompt...*

*Public Records...*

*...Processing...Define Records Requested...*

*Obituaries...*

*...Processing...*

"What are you doing?" Isaac asked warily.

"I'm looking for my family," Alec answered. "If we can find any of my brother's or sister's descendents, then we can seek shelter from them."

"I wouldn't be so sure..." Isaac began, but Alec waved his hand agitatedly, and Isaac shut his mouth.

*...Processing...Name*

*Daniel Savitt...*

A long list of names coupled with the date of birth, date of death, place of death, and name of parents began trailing down the screen. Alec hadn't been aware that his surname was so common, but he scanned the list of parents, looking for...

*Rachel and Tom Savitt.*

"This one!" he said excitedly, and selected it from the list.

*Name: Daniel Savitt*

*Parents: Rachel and Tom Savitt*

*Date of Birth: April 12, 2010*

*Date of Death: August 30, 2088*

*Cause of Death: Heart Attack*

*Survived by: Sister Clara Savitt*

"Perhaps he had no children," Isaac suggested when he saw Alec's shoulders slump.

"One last chance," Alec said bitterly, changing his search for Clara.

*Name: Clara Savitt*  
*Parents: Rachel and Tom Savitt*  
*Date of Birth: January 12, 2015*  
*Date of Death: March 29, 2089*  
*Cause of Death: Natural Causes*  
*Survived by: N/A*

“That can’t be!” Alec shouted at the screen. “Where is Emma??”

*Name: Emma Savitt*  
*Parents: Clara Savitt and Henry Keen*  
*Date of Birth: September 20, 2044*  
*Date of Death: October 9, 2062*  
*Cause of Death: Cancer*  
*Survived by: N/A*

It was several seconds before Alec heard Isaac saying his name next to him. “What?” he said quietly.

“We can’t stay here. There’s *nothing* for us here.”

“And where...” Alec said darkly, “do you suggest we go?”

“Back into the time machine,” Isaac said quickly, sensing that Alec’s temper was flaring. “We go forward as far as we can and hope that we come out on the other end of a better century than this one.”

Alec surged to his feet and pushed Isaac against one of the walls, gripping his shoulders tightly. “That hasn’t worked so far! I have lost everything I could have ever known for this machine, and you want me to go *further*?? Are you insane?”

“What else can we do?” Isaac shouted back furiously. “I didn’t force you to come with me, you chose this!”

“I did,” Alec said hoarsely, letting go of Isaac’s shoulders. “And now I choose a different path.”

“Where are you going?” Isaac asked as Alec walked towards the door.

“To your damned machine,” Alec replied over his shoulder, his voice trembling with rage and grief. “I’m going back and I’m fixing this mess.”

Before he could open the door, Isaac’s hand was on the knob, preventing him from leaving. “You can’t do that Alec,” he said softly.

“You will not keep me here,” Alec whispered dangerously.

“That’s not what I meant! You can’t go back. To the past, I mean. You won’t be able to do anything there that will change what has happened up till now. You will walk around in worse isolation than what has befallen us today because

you will be surrounded by people you cannot change. The laws of physics will turn you into a ghost, Alec.”

Alec’s shoulders had continued to drop with each of Isaac’s words until he found himself leaning his head against the office door, tears streaming down his face.

“We’re in the desert, Alec,” Isaac said gently. “We have to keep trying to make it to the oasis, and you can’t get there by going back. We have enough food still in the machine that we can jump for maybe another century, if we ration it. Who knows...we might get lucky.”

Alec straightened and wiped his face with his hands. “How can a man who believes in fate believe in luck?”

“It was just an expression,” Isaac said.

As they disengaged from the offices and moved off into space again, Alec wished he could see the blue globe diminish into space behind them. He had not set eyes on a single piece of the Earth in nine months. He had not seen anything other than white walls and computer pieces in nine months.

At this rate, he was not sure if he would ever see another human being apart from Isaac ever again.

When he had first set foot in this machine, he had been running away from the present and into a future without thinking about the consequences, without really contemplating what he was giving up. Isaac had, at least, known exactly what he was doing. Elly’s words kept echoing through Alec’s head as he sat watching Isaac manage the computers: ‘I hope you find what you’re looking for.’ She had said it over two hundred years ago, but Alec silently thanked her for her hope. He wasn’t sure he had any left. He had foolishly left behind the very thing he knew now he was running towards...and he suspected it was the same thing that Isaac had running towards all along, too.

## Creative Journal

### Characterization and Plot Notes:

#### Character names workshop – names of researchers

Craig Callender  
Sean Carroll  
Isaac Newton  
Carl Hoefler  
David Horacek  
Tim Maudlin  
Colin Milburn  
Bradley Monton  
Paul Nahin  
Steven Savitt  
Walter Smith  
J. Venn

#### Alec Savitt

-tall and thin from years spent in a hospital bed; dark brown hair, blue eyes; ‘Bruce Banner’ way of walking, talking, moving around: ever since he woke up he is slightly on edge, nervous, displaced; very pale from living in a hospital for eight years

-is an astronomer/astrophysicist; he studies the present state of the universe

“A decade ago, an astronomer died at an observatory when a special set of interlock doors in the observatory dome failed to operate properly and he was crushed to death between the inside and outside walls of the rotating observatory dome at Kitt Peak. I have even heard of close calls in which astronomers working high up at the prime focus of a telescope, have nearly fallen 2-3 stories down to the hard floor during long observing sessions while tracking objects. During a multi-hour photographic session, you are inside the prime focus cage, and this cage can move from as low as 5 feet above the floor to 2-3 stories. If you forget where you are, you can take a wrong step out of the cylindrical cage and fall to your death. I have never heard of this happening, but have heard of at least one close call.”

(<http://www.astronomycafe.net/qadir/ask/a11552.html>)

## **Isaac Venn**

-shorter than Alec by a bit but not by any means short; graceful, expressive, self assured; reddish brown hair (red beard when he grows it in) and hazel eyes; can be very intense, loves surprises (from his work, not from other people); very pale from spending most of his time in a lab underground

-Isaac is a cosmologist; he studies the beginnings and the future of the universe

-quotes all the time; other than studying or experimenting, his favorite past time is to read, and he absorbs various tidbits that he quotes endlessly to the eventual annoyance of all around him

**Austin Dobson** – “Time goes, you say? Ah no! Alas, Time stays, we go”

**Albert Einstein** – “If it wasn’t for time, everything would happen at once”

**Yamanoue Okura** – “We are helpless before time / Which ever speeds away.  
And pains of a hundred kinds / Pursue us one after another. This is the way of the world; / And, cling as I may to life, / I know no help!”

**Pythagoras** – “Time is the soul of this world.”

**Bhagavad Gita** – “Know that I am Time, that makes the worlds to perish, when ripe, and bring on them destruction.”

**Henry Van Dyke "The Sun-Dial at Wells College"** –

“The shadow by my finger cast  
Divides the future from the past:  
Before it, sleeps the unborn hour,  
In darkness, and beyond thy power:  
Behind its unreturning line,  
The vanished hour, no longer thine:  
One hour alone is in thy hands,  
The NOW on which the shadow stands” (Nahin 148)

**Shakespeare's Pericles** - “Time's the king of men; He's both their parent, and he is their grave. And gives them what he will, not what they crave.”



-not interested in traveling to the past; does not believe you can change the past, only influence it, but is there also a personal reason (other than the fact that the past has 'already been done')? something terrible in his past that he doesn't feel the need to relive or resee – he lost his entire family *somehow*.

-doesn't get along with the Department of Paradox (mostly because of his excessively dismissive attitude towards paradox in general but also partly because of his views on backwards time-travel)

-in response to John Earman's paradox machine: "Congratulations. You haven't ruined time-travel, you've just wasted research funding on a useless piece of machinery"

"The question now does not become 'Am I going to kill my grandfather,' but rather 'What can we do with this machine?' If you want a brain puzzle go solve a crossword."

**Story Timeline and Outlines:**

*Backstory*

Age	Alec Savitt	Date	Isaac Venn	Age
		<b>2035</b>	Starts working his way through college by selling anonymous articles on advanced scientific theory to various research and development corporations and working in a local lab	18
		<b>2039</b>	as a note-taker; close to graduation he is ‘discovered’	22
28	Coma-inducing accident occurs	<b>2041</b>	by a prestigious metaphysics/astrophysics lab that offers to send him to graduate school and doctorate school if he will also work in their experimental theory department. He agrees	24
		<b>2047</b>	and after eight years discovers time travel. Everything we knew about the cosmos has to be rethought to accommodate time travel and the project develops	30
36	Wakes up from an 8-year coma with his personal memories destroyed and his scientific knowledge intact. Joins a prestigious science program to which he had been invited previously but had turned down. Meets Isaac Venn and the adventures begin	<b>2049</b>	to testing stage just as Alec Savitt wakes up from his coma	32

## **I. Introductory Story (2049 A.D)**

**A.** Alec Savitt wakes up from a coma; the flowers on the stand are faded and dropping, and a picture frame sits next to it with people he does not recognize; the damage to his brain has given him unalterable amnesia. He is told that after a long night working inside the prime focus cage of one of the Space Telescope Science Institute's telescopes he missed his step exiting and fell eighty feet to the floor below; he survived because of the many parts of the telescope that he hit on his way down, causing serious injury but slowing his descent enough that he did not die. After an awkward and confusing reunion with his family, final medical checks, and at last a gradual but steady diet of solid foods (all of this taking a couple of weeks), Alec returns to his parent's house, where they have moved all of his belongings.

## **II. Theory Story (2049 A.D)**

**A.** Among his files, which Alec finds himself going through to attempt to recall to memory any aspect of his life, he finds his thesis from graduate school on the motion of the solar system in relation to the expanding universe as well as a letter from a man named Isaac Venn inviting him to join a project exploring current astronomical structures. He remembers this letter faintly and remembers everything about his education – all of his memories of science are intact.

**B.** Alec tells his parents that he is leaving, and though they protest, they realize that the son they lost probably is not coming back. Alec packs a few belongings and takes the first flight he can to Washington D.C., followed by a cab ride out into the country to the Maudlin & Smith Astro-Metaphysical Lab. He walks in and puts his letter on the counter, asking to see Isaac Venn. A scandalized lab assistant working the front desk tells him he needs an appointment, but Alec is not in the mood for an argument. Luckily a smaller, younger man walks up to him introduces himself as Isaac Venn.

**C.** Isaac takes Alec several floors down past high security and then to an atmospheric elevator – the headquarters of the project are in the upper ionosphere. He then introduces him to the team, including the Department of Paradoxy. He explains how he came on to the project (his background story) and describes what has been done in the eight years that Alec has missed. Alec is surprised to discover that Isaac is talking about time travel. After a rudimentary tour, the Isaac locks them both in his office and proceeds to introduce himself properly. When Alec questions the drop in formality, Isaac scoffs at his 'feigned ignorance' and announces his presumption that Alec is, of course, coming with him. Alec is annoyed, though he realizes that Isaac is perfectly right. He asks why he was never replaced, especially since all of the hard mathematical work he might have helped with is now done. Isaac points out that many astronomers have come and gone on the project and that none were willing to put everything on the line.

Ultimately, Alec's situation with his family is ideal. He asks why the letter said they would be studying astronomical structures, to which Isaac replies with another question:

**D.** What is the point of the whole project? Why travel in time? What are they looking for? Isaac asks Alec, why indeed? Why would *you* travel in time? Alec supposes that time travel is entirely personal – to travel back to meet your ancestors, or out of curiosity, or to travel forward to a more advanced period of time. He wonders how time travel can be used for anything but personal motives. Isaac then discusses the time travel machines that were invented in the 16<sup>th</sup> and 17<sup>th</sup> centuries: telescopes. The more advanced they became, the farther back man could 'travel.' But Isaac points out the discrepancy: we can observe what is happening *right now* as far as our own solar system is concerned. But everything further out that we view is shifted back in time. We are seeing the universe as it was billions of years ago. What is it like today? The answers could be vital. Isaac explains that the idea is to travel in both time *and* space (for that is required by all time machines) and see how things are in distant galaxies in the present. The space travel itself would normally take light-years, but with the time machine they can combat time itself and arrive in 'no time at all' (forward in space but backwards in time – possible because of the difference between proper [personal] time and general [world] time). The first visit is to NGC3603, a young nebula a little more than 6 kiloparsecs away (20,000 ly). Because the calculations require data to be precise, the first trip will not allow them to return to their exact time frame – they will be off by a few decades when they return.

### **III. Travel Story (2049 A.D. Proper Time / 2049-2062 A.D. General Time)**

**A.** Alec and Isaac discuss temporal metaphysics, paradoxes, as well as the differences between traveling forward in time and backwards in time. Isaac then introduces Alec to the rest of the team, and Alec spends a few days catching up on the project.

**B.** A group of scientists is left behind to continue researching in their absence, led by a man named John McMillan. He and Isaac shake hands solemnly, knowing that they will likely never see each other again.

**C.** Alec and Isaac get into their machine (looks like an advanced space telescope with a small crew quarters placed on the bottom; a series of rapidly spinning hoops (Tiplerian Rotating Space-Time Disruptors) replicate the time distortion of a tipler cylinder; a protective anti-matter field surrounds the entire machine to reflect space matter) and set off into space. The first visit is to NGC3603, a young nebula a little more than 6 kiloparsecs away (20,000 ly).

**D.** Describe life en-route in the time machine. Alec and Isaac are, at first, a bit awkward around each other. They barely know each other and now live in extremely close quarters (the ship is barely big enough for two). Isaac has brought

along a plant to help produce oxygen and ‘boost morale.’ It reminds Alec too much of the flowers in his hospital room and he secretly dislikes it. They live on a diet of ‘frozen airplane food’ as Alec calls it. Isaac spends most of his time reading, leaving Alec to struggle with his thoughts and memories. To distract himself from the vacancy in his head, Alec decides to pull Isaac out of his shell by bombarding him with questions, both personal and academic. The ship’s one telescope keeps an eye on the star cluster the closer they get to find a safe place to ‘park.’

**E.** Upon arriving at NGC3603, the ship’s computers, cameras, and sensors go into overdrive, collecting as much information as possible. They float and collect data for a month in general time (the time machine is turned off for this period).

**F.** At the end of the month, the plant has died (Alec rejoices). Isaac shrugs it off and they set the time machine in motion once again, ‘forwards in space and backwards in time.’ Upon their return, the first thing Isaac sets out to do is to rush to the Department of Paradox (the doom and gloom crew, as he calls them) to gloat that nothing bad happened on their journey and that the fabric of the universe is still intact. As Isaac finishes laughing, however, Leeds immediately jumps at the opportunity to prove that time travel is dangerous and can only lead to the destruction of humanity. He makes a case for the technology getting into the wrong hands and the past being destroyed by enemies of the country. Isaac pays him no heed (pointing out once again that changing the past is impossible) and proceeds to ignore him for the rest of their visit.

**H.** During this time, Alec obediently follows the frazzled company doctor to his clinic to undergo a detailed physical; he is rather irritated at Isaac leaving him with this part, since he has become very disenchanted with doctors since his long hospital stay. Isaac’s next stop is to visit the scientist in charge during their absence, Elly Jacobs (previously intern). Her predecessor, John McMillan, has left her well prepared. Isaac explains the trip briefly to her and refers her to the ‘ship’s log’ which is stuffed full of more data than their computers can probably handle all at once. They get to work at once analyzing the differences in what they currently know about NGC3603 and what the time machine says is actually the current state of the nebula.

#### **IV. Final Story (2345 A.D.)**

**A.** Isaac is told by the director of the program that the company wants Alec to stick around for the data to be analyzed (the director has read some of Alec’s work from years ago and is amazed that he does not have a more prestigious role, claiming him to be a genius). Isaac protests that he needs a proper astronomer on board with him and equates leaving Alec behind as a death sentence. **“Dead to you, perhaps. You come and go like some ageless god,**

**while the rest of us grow old and watch the entire project slip through our fingers and into the hands of the next generation. The point is, the *project* takes precedence.”** The director reminds him that the project is not his, and that the company needs Alec’s mind on the job and cannot afford to send him. If anything, they will send someone else.

**B.** Isaac rushes the next trip to only a couple of days after their arrival, spending the entire time keeping Alec away from the director and his assistants. He does not tell Alec about the director’s decision, and manages to sneak Alec onto the machine with the help of Elly Jacobs. They head off in another direction (30 Doradus, which is *much* farther away than NGC3603 – 49 kiloparsecs). Elly promises to leave behind a proper legacy for the next leader of the team, since they are not even sure when Isaac and Alec will return. Due to the extreme distance, the time period turns out to be much larger than they had anticipated.

**C.** Only a few decades after they leave, time travel is outlawed (this is the fault of the student in the Department of Paradoxy who, failing to excel as a scientist, goes into politics); the tactics used are fear based, the idea being that other countries (specifically countries unsympathetic to America) could steal the technology and use it in an all new form of ‘temporal war’ – these theories ignore the logical science and prevail because the opponents in favor of Isaac Venn’s theories have no proof either, and fear is stronger than logic.

**D.** When Alec and Isaac arrive in their machine, they are wanted men. The headquarters have been abandoned but left intact due to the astronomical feat of dismantling the atmospheric elevator. Disturbed, they consult the main computer and find the last logs of Elly Jacobs, explaining what has happened and warning them of the danger of their return. Public records reveal that the scientists have all been sent to prison or given up the field for a less controversial area of study decades ago – most of them have died of old age. Alec is alarmed that they will be discovered, but Isaac points out that they are likely already known; people are, undoubtedly, on their way up.

**E.** With nowhere else to go, Alec suggests that he find his descendents for protection; Isaac protests this as a bad idea, but cannot make himself heard. He finds that he does not have to worry – after a little research, Alec discovers that his family line died with his siblings (his brother died without children and his sister’s only daughter died of breast cancer). Desperate and despairing, Alec contemplates stealing the time machine and leaving Isaac stranded momentarily, travelling into the past to witness his life before the accident; but Isaac stops him and reminds him that this cannot be because it did not happen.

**F.** Alec and Isaac return to their time machine and decide to continue travelling forward in time until they come to a period where they can start again.

## Glossary\*

### Arrow of Time

The statement that time appears to have a direction—that there is a difference between the past and the future.

### Causal Loop

A time loop containing an event caused by a *later* event that, itself is caused by the earlier event

### Closed Timelike Line (or Curve)

A timelike world line of finite length that has no ends, i.e. that forms a *closed loop* in spacetime. A region of spacetime containing closed timelike lines is said to be a time machine.

### Determinism

The metaphysical belief that effects are uniquely determined by causes (which is *not* fatalism).

### Entropy

A measure of the randomness of a system. Entropy plays the central role in the thermodynamic arrow of time.

### Fatalism

The metaphysical belief that all events have been *predetermined* from the beginning of time.

### General Theory of Relativity (G.T.R.)

Albert Einstein's 1916 theory of curved spacetime, currently used in modern physics, explains gravity in terms of nothing but geometry. The G.T.R. generalizes the Special Theory of Relativity and Isaac Newton's law of universal gravitation to result in a concept called space-time. Its fundamental premise is that *all* the laws of physics should appear the same to all observers in *any* reference frame.

\*Some definitions acquired from and/or supplemented by Dr. Paul J. Nahin's book *Time Machines*

### Grandfather Paradox

*The classic time travel paradox, of a time traveler killing, while in the past and before the time traveler has been conceived, an ancestor directly linked to the future birth of the time traveler. A time traveler simply killing his younger self is the most direct form of this type of paradox.*

### Hard Science Fiction (H.S.F.)

Science Fiction that endeavors to adhere to accepted physical reality and natural laws, thereby combining education and entertainment.

### Many-Worlds Interpretation

Quantum mechanical view of splitting universes.

### Newton's 'World Clock'

The concept that time is universally synced; a second on Earth has the same measure as a second in a distant galaxy.

### Red Shift

The *down* shift in the frequency of light received from all distant stars due to the Doppler effect induced by the expansion of the universe. The opposite effect is called a *blue shift*.

### Soft Science Fiction (S.S.F.)

Science Fiction that does not adhere to physical reality and natural laws, allowing greater freedom for the writer; also called "Space Opera" or "Futuristic Fantasy."

### Spacetime

The combination of space and time into one entity via the Special Theory of Relativity, making motion a defining attribute of time. It is the stuff out of which reality is built. Everything there is—the *universe*—is the total collection of events in spacetime. A *flat* spacetime has no gravity, whereas a curved spacetime is the *origin* of gravity.

### Special Theory of Relativity (S.T.R.)

An earlier work of Albert Einstein's (1905) that expands upon Galileo Galilei's theory that all uniform motion is relative by accounting for the speed of light. It is his theory of *flat* spacetime, which assumes that gravity doesn't exist (gravity is the result of the geometry of *curved* spacetime).



**Temporal Metaphysics**

The study of the physical and theoretical nature of space-time (or, more generally, time), and the manner in which they can be affected by outward forces such as gravity or human technology.

**Second Law of Thermodynamics**

The constant evolution of the entropy of a system towards maximum disorder, called thermodynamic equilibrium.

**Timelike**

A world line on which propagating mass-energy always travels more slowly than light.

**Tipler Cylinder**

A theoretical time machine created by Frank Tipler: an infinitely long, very dense cylinder rotating at half the speed of light, thereby creating closed timelike lines that connect events in spacetime, allowing for backwards time travel to any point after the cylinder's creation.

**World Line**

The trajectory mass-energy in spacetime.

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