

# Necedah

By

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## Synopsis

On a massive planet, a peaceful culture is split into two by climatic change. Separated by immense distances, they develop separately over the next two millennia. When they meet again, one is backwards and militaristic, the other advanced but altruistic. Only one way will lead them forward.

## Dedication

To my loving wife, who has steadfast supported me to go wherever my interested, talents and ambitions drive me.

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## Prolog

Necedah was a massive world. It was also a unique world. In all the universe, there was no other planet like it. It was the anomaly that arises when a 1/near-infinity improbability meets the near infinity of the universe.

Necedah started out as a brown dwarf, a collection of hydrogen gas too small to become a star. In mass, it was about 8% the mass of Earth's Sun. But in size it started out large, formed in a pocket of space by drifting gasses that intersected yet became intertwined by gravity. As it was coalescing into a rotating dwarf, it was also being pulled towards a nearby nebula made up of the remnants of a supernova. At ten-million years old as it started to enter the nebula, it was still a very young body. Just beginning its gravitational shrinking phase, it was still slightly wider than the diameter of Earth's Sun. But since it was collapsing, it was also emitting immense heat as the potential gravitational energy was converted into thermal energy.

The section of the nebula that the dwarf was now immersing itself in was unusual in its own right. It was a sparse cloud of molecules of a complex metallic substance that is only created in third generation supernovas. The properties of this substance was exceptional in that, when cold, it was neither attracted nor adhesive to other non-bonded molecules of the substance; however it had almost a nuclear hold on molecules that were already bound to it. Yet, when heated and the electrons were excited, the substance became highly attractive and with extremely strong bonding as the molecules merged together.

As the substance encountered the outer shell of the impacting dwarf, the substance became heated, and started bonding with other molecules, which in turn bonded with other molecules. As the outer gases of the rotating dwarf pulled along the adhering substance, it created a sheen of the substance wrapping around the dwarf, with the sheen floating on the pressure of the dwarf gasses below. And as it went through the cloud of the substance, the sheen became a sheet, and the sheet became a blanket, and the blanket became a casing. As the dwarf exited the substance space, it was encapsulated by thick shell of the extremely adhesive and strong substance. And since the adhesive properties of the substance was stronger than the centrifugal forces, the substance flowed into an almost perfect sphere that was over 11 miles thick, encasing a hydrogen brown dwarf almost a million miles in diameter.

In journeying through the remainder of the nebula, the dwarf accumulated significant space dust to create a layer of space dirt over the substance. As the dwarf exited the nebula and then ventured through vast open interstellar space, it continued to gather a variety of different materials and elements, eventually creating a crust that was almost five miles thick, including what would be the equivalent of about a quarter mile of surface water.

In the void of space, the radiating heat was quickly absorbed by the coldness of space, eventually causing the sphere to cool. As it cooled the substance comprising the sphere became an almost inseparable, rigid mass, held in place and in form by the strong chemical bonds between them.

The substance had one additional special property to exhibit. It absorbed and dissolved hydrogen gas. As it reached saturation point, it would emit the hydrogen out as well as absorb it. On the inner side of the sphere, the gas might escape out, only to be reabsorbed again. However, on the outer side of the shell, the hydrogen would escape, and when it encountered the heavier elements, it would quickly work its way up to the surface, then shoot off into space. This resulted in a slow bleed of the hydrogen out of the inside of the sphere. Over time, it bled off almost half the mass of the original brown dwarf inside.

After drifting through space uneventfully for eons, Necedah approached a star system with a young Type G star at its center. Caught in the star's gravity well, it was left hurling towards the star in a near collision path. While Necedah had about the same diameter as the star, its mass was only about four percent of its new partner, making the star the undisputed dominant body in the system.

As Necedah journeyed inward in a hyperbolic encounter, it compounded the captivation in a near miss encounter with an orbiting rock giant planet, much smaller than Necedah, but about the same mass. The encounter causes Necedah to whip around the other planet in a strange dance that caused the other planet to fly out of the system in a similar hyperbolic trajectory while also pulling Necedah back towards it, but at a much slower speed. As the distance between the two increased, the pull decreased. Eventually, the soon to be forgotten planet flew off into the recesses of space, leaving Necedah in a nearly circular elliptical orbit around the star; an orbit that also resided in the "goldilocks zone", neither too hot or too cold to support life.

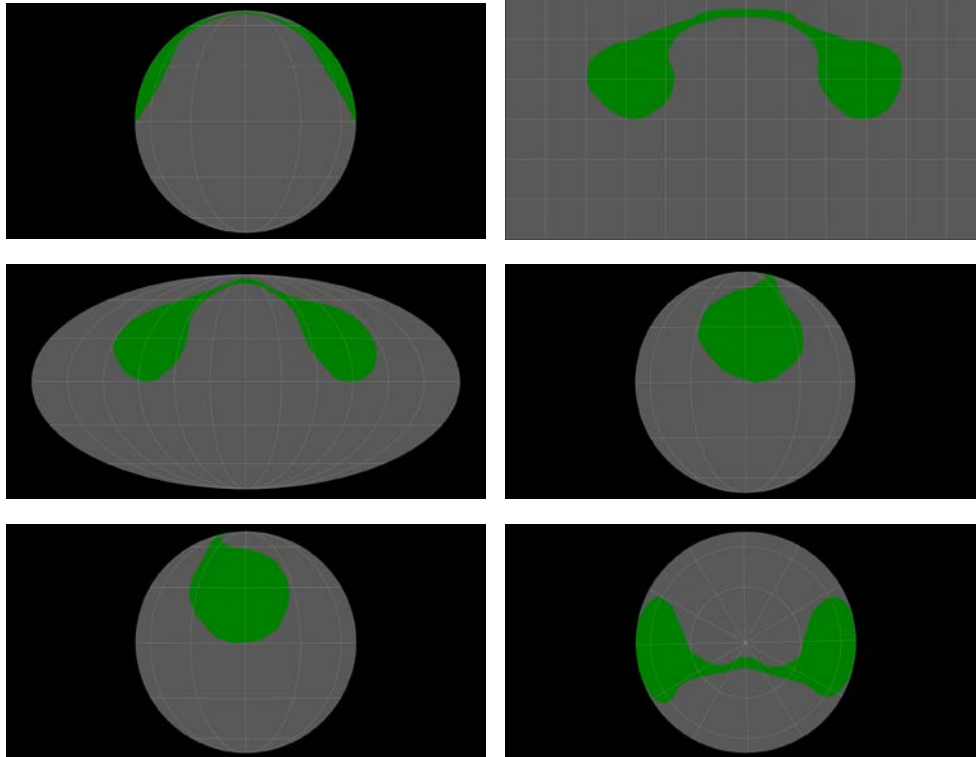
The many moons of the ejected giant were also left scurrying about; most lost, and in many directions. However, one, about a hundredth of the mass of Necedah, was captured, ending also in a near circular elliptical orbit around Necedah, providing ongoing stability to Necedah and its 10 degree axis incline to the central star.

But Necedah did not survive the encounter unscathed. It's near perfect spherical body became amiss, with two bulges on either side of the planet. These bulges were a little shy of five-hundred-thousand miles across and almost an equal distance north-south, with a small bridge connecting them that came within hundred-fifty-thousand miles of the North Pole. In reality, to anyone on planet, this would have looked like a small arc of land near the North Polar Region. Although small in comparison to the bulges, the bridge was still sizable; about fifty-thousand miles wide, by about a hundred thousand miles long; with mirrored East and West South jaunting sides going down to the oval bodies on opposite sides of the planet.

Although without volcanos, the encounter and heat generated left the surface of Necedah with a fiery organic primordial sauce that would someday give life to Necedah. Then, the heat would subside and the atmosphere gave way to a rich nitrogen-oxygen mix. Likewise, the primordial ooze slowly transformed to oceans and land that supported increasing complex forms of life. A couple billion years later, intelligent life takes root, and a few tens of millennia after intelligent life forms, our story begins.

Someday, Necedah would end in a magnificent and cataclysmic implosion. But that is far, far after our story.

Maps of Necedah





## Section I – Paradise

## Chapter 1 - BluestoneCutter

Professor BluestoneCutter sat leisurely sipping his mid-day tea from his second story deck while looking out over the SouthCentral City harbor and the South Ocean beyond. He adjusted his light sweater, a little more snugly than regular. Although it was mid-day and clear, it was a nippy 18 fB<sup>1</sup> with the typical slight breeze from the northwest.

Normally at this time of day he would be working at his office in SouthCentral University. But today was LowSun day, and like every year, he took it off to relax at home and take in his view. As he looked South, his view was slightly obstructed by the Sun hanging just a few Sun widths above the horizon. As indicated by the day, the sun was at the lowest high-point of the year, just a few degrees above the horizon. But as it hung low in the sky, he felt fortunate being on the South shore. Many of the northern cities would see no sun today, and in fact had already entered the long night; some of them more than a dY<sup>2</sup> ago. But being on the south coast the sun never entirely vanished, but would at least peek out just above the horizon for a little bit each day.

Moreover the northern shore was about 15 degrees colder, getting down to -10 fB<sup>3</sup> in the middle of the night now, versus always staying well above freezing on the South coast. He knew here it could get balmy in the warm session, getting as high as about 30 fB<sup>4</sup> in the day, but also staying around a mild 20 fB at night. The North coast, about 50,000 KL<sup>5</sup> to the north, would never get much higher than a brisk 15 fB in the warm season.

On the other hand, going south was definitely not better. The 3-day rains abruptly stopped within about 1500 KL<sup>6</sup> south of SouthCentral City, and this seemed to happen at the same latitude around the entire northern region. So the land masses extending out to the southwest and southeast of habitable Necedah were vast deserts. Moreover, besides being parched, they became hot very quickly. Prior to last cool season, research ships had only made it as far south as about 20,000 KL<sup>7</sup>, both along the eastern and western southern coasts. At 20,000 KL down, it was about 15 degrees warmer there. So instead of a chilly 18 fB, it would now be around a warm 31 fB. In the warm season, it would be a

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<sup>1</sup> 18 fB (Freezing to Boiling scale) = 64.4 degrees Fahrenheit = 18 Celsius

<sup>2</sup> dY (1/10<sup>th</sup> of a Necedah year) = 1.02 months

<sup>3</sup> -10 fB = 14 Fahrenheit = -10 Celsius

<sup>4</sup> 30 fB = 86 Fahrenheit = 30 Celsius

<sup>5</sup> 50,000 KL (thousand standard Lengths) = 51,420 Miles [1 KL = 1.028 miles]

<sup>6</sup> 1,500 KL = 1,542 Miles

<sup>7</sup> 25,000 KL = 25,710 Miles

nearly unbearable 45 fB midday. Models for 40,000 KL south indicated it was another 15 fB warmer there, getting up to 60 fB midday in the warm season, and never getting much below 35 fB in the middle of the night in the cold season.

He and his collages debated what it was like near the equator of the Necedah. Although they had clearly never taken any measurements from there, the learned consensus was that it was almost certainly near 100 fB all the time, with the water so superheated the thought was it would be more plasma than ocean, but keeping the temperature just below boiling. Between the distance – almost 540,000 KL south - and the extreme temperatures, he couldn't imagine how anyone would ever be able to see that area, much less ever survive there.

“Yes,” Professor BluestoneCutter thought to himself, “this is just where I want to be. My little piece of Paradise.”

Turning his attention back to the serene view, as long as Professor BluestoneCutter diverted his view a little east or west to avoid looking directly into the Sun on the horizon he could take in all the vantage point from his deck had to offer. In the harbor, he was taken in by the majesty and beauty of the Clipper ships coming in and going out of the harbor. For hundreds of years, they had been the backbone of cargo commerce between the other coastal cities of Necedah. The beauty and elegance of the design showed the maturity of both the art and science of Clipper ship building.

But as his focus changed, he was just as impressed by the wonder of the new class of steamers also making their way in and out of the harbor. They were just one of the marvels coming out of the current and accelerating Age of Discovery. He had read that almost all the new ships being built were steamers. He pondered that while they were faster and could keep a schedule more dependably than the Clipper ships, the steamers also had the flaw that they had to be fueled. While new fueling depots were being built along the coastal cities radiating out from the main hub cities, there weren't enough of them to make the 50,000 KL journey to either SouthWest City or SouthEast City. So, at least for the time being, the steamers were restricted to regional transports, leaving the Clippers for the long journeys between the hub ports.

As he took another sip of tea, his gaze wandered from the harbor to the city around him. There were very few other two-story houses in SouthCentral City, giving him a very commanding view of the harbor and surrounding city. Most of the buildings were still made of wood, but more and more were made out of brick, or, for the more grand structures, stone. Looking upon the city around him, he reflected how

lucky he was to be in this house. His position as Professor Emeritus of Meteorology at SouthCentral University afforded him both the prestige to have it and the time to enjoy it.

Professor BluestoneCutter reflected how he had come to live here. There was almost unlimited amounts of land available in Necedah. With about 5 billion square KL of land, the population of 500 million citizens hardly made a noticeable dent in it. There was so much land that it was free for anyone take as long as there no one else had built there. Moreover, with so much free land, it was culturally taboo to sell it, although once you built there you could ask a fair value for the building on it. However, the value was usually calculated on the labor it would take to build a similar house, without consideration of the land beneath it. Still, even though there was ample land to just take, and it had no inherent value, some land was more valueless than others. So any existing land that had a building in a good location, tended to be passed down or given away rather than selling for building value. This particular spot of land of his was about a half mile from the University and two blocks from the harbor, and had been given to the University about 200 years ago by another professor who had first built here. As the ranking Professor Emeritus, he was able to choose this place when the last Professor who lived here retired and moved to the retired Professors homes that were built by the university about 50 KL inland. Professor BluestoneCutter loved this location and was going to keep working as long as he could just so he could keep enjoying it.

In large part he had earned the title of Professor Emeritus by winning the Central Science Academy's Renowned Discovery award. This was the most prestigious Sciences award in all of Necedah and was only awarded a to a maximum of one research professor each year at the annual Science Academy conferences, and only then if the discovery was deemed worthy of "A discovery that shapes the way people live and allows the citizens of Necedah to achieve a better standard of living". In fact, historically, it was only awarded 38% of the time. The other 62%, no one was given the award that year. So in a 10 year period, it was typically given out only about 4 times.

Professor BluestoneCutter had won the award for his discovery of why the 3-day rains could vary their stop and end time. The environment in Necedah was very predictable and very regular. Every 3 days it would rain for about 5 cD<sup>8</sup>, for a total of about 1.5 cL<sup>9</sup> of precipitation. However the rain's start and stop time could vary by almost 9 cD<sup>10</sup>. Professor BluestoneCutter had shown that by tracking the speed

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<sup>8</sup> 5 cD (1 cD = 1/100<sup>th</sup> of a Necedah day) = 3.6 hours.

<sup>9</sup> 1.5 cL (1 cL = 1/100<sup>th</sup> of a standard Length) = .977 inches

<sup>10</sup> 7 cD = 5.1 hours

of clouds in the sky above for the days preceding the rain, you could predict if the rains would start sooner or later. If the clouds moved slower than average, the rains would arrive later, if they were moving faster, it would arrive faster. He developed a formula that allowed people all over Necedah to predict the rainfall arrival within 4 mD<sup>11</sup>, which led to his award by the Academy. Because of that award, he was only one of 2 Renowned Discovery award winners in all of Southcentral University's staff and was one of only 4 Professors given the rank of Emeritus.

Being an Emeritus definitely came with its privileges. He was allowed to either lecture or do research, or a combination of both, as he preferred. Moreover he was given priority scheduling to all the research facilities, had unlimited access to all the labs, and could teach any classes he decided to teach. He was commander of his own destiny. Professor BluestoneCutter had decided to lecture one class each year on advanced Meteorology studies, that was only open to students he invited, and conduct research about 100 cD<sup>12</sup> hours each dY<sup>13</sup>. Of course, he could choose what to do in his research hours, so he could finagle them to however he wanted to spend his time.

But despite all the flexibility he had with his time, he still chose to officially take this day off each year as one of his 7 vacation days, just to enjoy what he had achieved.

Professor BluestoneCutter, taking another sip of his tea, looked down at the postal mail he had brought up with him. He sorted through the typical stack, seeing the normal letters from other professors and colleges, as well as official documents.

While going through them, he silently chuckled to himself as he noted the addressee: *Professor Emeritus Nord BluestoneCutter*. It had been over 250 Ys<sup>14</sup> since a cast system of hereditary labor skills had been abandoned. True, for as long as history recorded before then, a culture had developed where a father would pass down his trade to his son, who would pass it down to his son and so on. Changing your trade was never a consideration, much less an option; that's just how things were done. Women had a little more flexibility in that they could marry into any cast; but once married into it, that was their position for the rest of their lives, just like their husbands. And this system worked with great efficiency. Since Necedah's weather and crops were so dependable and consistent, although the population changed, the proportions between the various trades didn't. Whether you were a carpenter, a farmer,

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<sup>11</sup> 4 mD (1 mD = 1/1000<sup>th</sup> of a Necedah day) = 17.4 minutes.

<sup>12</sup> 100 cD = 72 hours

<sup>13</sup> dY (1 dY = 1/10<sup>th</sup> of a Necedah year) = 1.02 months.

<sup>14</sup> 250 Y (Necedah year) = 208.7 years

an ironsmith, or a teacher, there was a set, consistent need for your services, for life. Everyone could contribute and have a life with abundant food and ready shelter – as long as every man did what his father did.

But the beginning of the Age of Discovery a couple hundred years ago changed that. Suddenly the demand for certain skill sets changed. There was an increased demand for iron smiths, and educators, and a whole new class of trades needed in the arts and sciences as discoveries started to make things both more beautiful and more efficient. At the same time, certain trades were being replaced with contraptions and devices, decreasing the need for them. Hence society had to change and abandon the cast system and permit men, and increasingly women, to move to the trades and professions where they were most needed and removed from those that were being reduced.

It had been 3 generations since Professor BluestoneCutter's great-grandfather had made a living from precisely cutting the valuable Bluestone. Yet, there was no move to eliminate the deep tradition of taking your fathers "tradenname" as your tradename, even though it was now probably not their trade for nearly half the population, and decreasing more so with each generation.

Returning from his internal chuckle which had descended into an intellectual self-lecture, the Professor continued reviewing his post stack, this time with a little more deliberant effort. He always paid a little more attention to those from further away. Letters coming from CentralCentral University, just 25,000 KL away, would normally take 1½ dY to get to Southcentral City by Yaze express. NorthCentral City, SouthWest City, or SouthEast City, all about 50,000 KL away would take 3 dY. Those from NorthWest City or NorthEast City, about 70,000 KL away, would take a little less than 5 dY to reach him. He knew those letters were important enough to wait a long time for a response. Alternatively, local letters were typically of a more mundane nature.

However, that wasn't always the case today. In flipping through the letters, he saw a package from CentralCentral Science institute, an arm of the Science Academy. And a package was definitely more attention grabbing than a letter. The weight and size of a package via Yaze express from one of the other hub cities cost much more than a typical letter, and hence had relatively more importance.

His first thought was that this was the formal package discussing his lecture at the SouthCentral Science Academy meeting in about 2½ dY, where he was to give a lecture on "Challenges in Predicting Daily Temperatures to 3 Significant Figures". The distance between the hub Cities was too great for people to travel between for casual reasons such as a conference – it could take from 3 dY to over a year to get

between the hub cities, and traveling by Yaze was never described as comfortable, even on the more elegant services. So every year each of the 9 hub universities would hold a regional Scientific Conference, where a number of talks on various scientific topics would be given. Each regional conference would then send the papers for the talks back to CentralCentral University, who would collect all of them, and disseminate them to the 9 University Libraries. One of those papers, if it was uniquely insightful enough, might be nominated for the Renowned Discovery award. If it was truly life changing, it might even win.

He had heard of papers in other regions that might be so incredible as to overshadow the winner from two years ago who had produced a paper on *“Commercially viable Electricity Generation and its Uses”*. That paper had launched initiatives in all the Hub Cities that had already surpassed the use ideas presented in the paper. But now he was told there were papers on two other revolutionary concepts.

The first, titled *“Instant communications between Cities using Electrical Signals”*, was a presentation on how using simple variations in open/closed circuits between the cities utilizing a coding system could allow for transcribing information instead of having to wait for it to be delivered by Yaze. The concept was not entirely new, but there were substantial hurdles to be overcome. For one thing the degradation of the voltage over long distances precluded a direct connection. Additionally, speed of light considerations would cause about a  $4 \mu\text{D}^{15}$  delay between the most distant hub Cities; the actual delay would be much greater. But the author had come up with an innovative way to re-amplify the signal along the way. Therefore, the signal could, in theory, go as far as possible. Additionally, they had developed a coding language that would allow for acknowledgements and transmitter reversal for bi-directional communications.

The second paper, *“Using Steam Generation to produce Inter-City Land Transportation Devices”*, was a joint concept by Citizen Nash ShipBuilder and a young CentralWest research professor to put a smaller version of a steam ship engine in a rail based land vehicle larger than an ore hauler that would allow for large scale cargo hauling as well as travel between the cities as fast as, and maybe faster than, Yaze transport. The concept, if practical, would not only change the fabric of long distance travel, but also allow for relatively comfortable travel between the cities.

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<sup>15</sup>  $4 \mu\text{D}$  (1  $\mu\text{D}$  = millionth of a Necedah day) =  $\sim 1$  second

It was truly a fascinating time to be alive, and he was anxious to see and read those papers, one of whom could very well will the Renowned Discovery award.

As a former winner, Professor BluestoneCutter was not eligible to win again. However, he was automatically one of the judges for all future awards as long as he was alive, and as such he had a good idea who the next year's winner might be from this year's papers. But the other, more important perk, at least in his mind, was that he was guaranteed a talk session if he wanted one; and his research had gone far enough that he had asked for a spot at this year's SouthCentral regional conference.

But as soon as he opened the package he noticed it wasn't for his lecture session, but instead was the monthly weather data he received as part of his research. As he started sorting through the data he grimaced to himself, half out of concern, and half out of annoyance.

Due to the time it took to transport the package, the data was mostly too old for his needs. For CentralCentral that data was 2 dY old, and for NorthCentral, SouthWest and SouthEast Universities the data was 4 dY old. For the other Universities it was even older. For his immediate concern, only the 2 dY, 3 dY and 4 dY old data had any relevance.

As the title of his talk this year - "Challenges in Predicting Daily Temperatures to 3 Significant Figures" - suggested, the temperature on Necedah was incredibly predictable and consistent. But 4 dYs ago, Professor BluestoneCutter had noticed that average temperatures over the dY was down by .05 fB over expected. Still well within the monthly statistical uncertainty of .07 fB. But the next month was down by .10, then .18, and last month it was down by .32 fB beyond expected. While all were not individually that far off, being down in the same direction, and also increasing each month, definitely got his attention. Not wanting to cause any undo concern, he had not gone over to Profession Rewt YazeshoeMaker's office yet to have him run the statistical numbers; but Professor BluestoneCutter suspected that three small variations measurements that were steadily and increasingly moving in the same direction each dY for 4 dY in a row, would, in fact, be very statistically relevant.

Professor BluestoneCutter had also convinced himself that a much more rational reason was that there was a systematic problem with the temperature equipment here in the SouthCentral facilities, and it was producing increasingly faulty and skewed measurements. However, the data from the other Universities was consistent with his data. All the cities showed a .06 to .08 fB decrease 4 dY ago, and CentralCentral University showed a decrease of .11 and .17, 3 dY and 2 dY ago, respectively.



He wasn't sure what the implications of this was yet, but he felt in his gut it wasn't good. But more to the immediate concern, it was going to really throw a wrench into his talk about "*Challenges in Predicting Daily Temperatures to 3 Significant Figures*" when the temperatures were shifting below the expected averages, and in an apparent non-linear fashion, making prediction even harder.

## Chapter 2 - ArtifactFinder

Professor ArtifactFinder was fixated on the perspiration running down his face as the first warning bell sounded. True, it was hot. At 33 fB it was damn hot. However, he was happy this was about 2 fB cooler than the projections his friend Professor BluestoneCutter had sent before their departure. He would have to give his friend some good academic ribbing when he got back for being 2 fB off, but since no known person had lived any closer than about 40,000 KL to the north of this place, he couldn't hold him too accountable.

Professor ArtifactFinder was also grateful that, being just before sunrise on LowSun day, it was now the coolest part of the day in the coolest part of the year. In 1.5 dD it would be an incapacitating 50 fB. In 5 dY it would be almost an uninhabitable 60. Which all begged the question why this place even existed.

Thinking of all this gave him the sensation that it was getting hotter, at which he was immediately annoyed that he would allow his mind to play such tricks on him. While he knew the sun would soon be coming up, and with its pending arrival the temperature would be going up quickly outside, the building he was in had thick stone walls, and it would be at least 4 mD<sup>16</sup> before they would notice any increased temperatures inside.

The profession then snapped his focus back to his surroundings, again annoyed, but this time at himself for dwelling on such trivial matters. This was the last dD of the last day of the most important archeological find in recorded history, and he had just spent precious moments thinking about the sweat on his face, and how fast the acknowledged uncomfortable heat was increasing.

His mind snapped back to his surroundings. He was currently standing at the doorway on the far end of the room they had come to call The Mess Hall. It was about 30 L wide by about 100 L long and comprised about 25% of the entire building. To the untrained eye, the sole contents of the room looked like 4 parallel rows of neatly arranged piles of dust and wood chunks, peppered with reddish veins of rust. It was as if an ore car with a trough had precisely and neatly poured 4 parallel rows of dust and wood chunks in a very smooth and regular pattern. However, Associate Professor HouseFramer who, as Professor of Historical Lifestyle Studies at SouthEast University, was doubling as their "expert" on furnishings and personal effects, said these used to be rows of wooden tables and benches, probably used for eating and other gatherings. The reddish veins of rust were what was left of low-grade iron

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<sup>16</sup> 4 mD = ~17 minutes (1 mD = ~ 4.35 minutes)

joints and nails, similar to what was in wide spread use about 500 years ago. Yet, the decomposition of the wood in this extremely hot and arid environment, indicated the site was much older – although admittedly their models were theoretical for climates such as these, as no known person had lived within 40,000 KL of this site.

Professor ArtifactFinder was glad they were able to document all the sites here through the new technology of photography. While the photos were crude and in black and white, the still were a vast improvement over writing description and hand drawings of findings. Even more so in a place like this that others couldn't visit and verify. Making photographs of this room was especially challenging. Being indoors, they needed flash to get photographs. Yet the flash power they had to use let off sparks in all directions. If any of those sparks touched this wood dust it would have instantly started a fire that would have consumed the entire contents of the room. So they had constructed a strange custom contraption of tin shielding that kept the sparks from going in the direction of the wood dust while also creating enough general light to make the photographs take. The complexities of using the tin shielding and the flash power to take photos of the room meant that it took them almost a full day to take just a few photos; but those photos were priceless and well worth the effort. Scholars back home would analyze them for years.

Having taken in The Mess Hall for a ceremonial last time the Professor made his way through the middle of the room towards the double doorway at the other end. As he made his way, he imagined large gatherings of 800 people sitting in here, having a meal and discussing whatever happened in their daily lives. But he was at a loss of what those daily lives could have consisted. Other than fish, there was no food source around here, no wood to build furnishings, and no game to hunt. Where would those 800 have gotten their food and supplies? And what was the purpose of living in such an inhospitable area, and how did it provide benefit to others? They had few answers and many questions.

As he exited The Mess Hall, he entered another room that was large, but not nearly as large as The Mess Hall. It seemed to be more of a junction room. Behind him, to the east, was The Mess Hall. To the south was a hallway that lead down to an area of common rooms and private quarters. To the North was a corridor that lead to functional areas of the complex; kitchen, pantry, meat locker, storage rooms, etc. And to the west was what they called The Map Room. The Map Room was a medium sized room that abutted the entrance foyer to the southwest of the Map Room. In the middle of the Map Room was the remnants of what they believed to be a ceremonial table with statues or ornaments on it, now spewen about the floor. On the north wall was a hieroglyphic map of what looked like a crude drawing

of this building on the middle of a small hill, surrounded by a shallow circular trough and various symbols surrounding it. Professor ArtifactFinder was looking forward to the briefing review by Assistant Professor LandMarker today as to the meaning of the symbols.

Professor ArtifactFinder looked out though the building entrance to the Southwest, taking in the light that was radiating the room, and the heat that was accompanying it. He knew the second warning bell would be ringing soon, and all his associates would be joining him. On most “normal” mornings, there would be just 2 warning bells – one at 7 mD before 47 cD<sup>17</sup> warning them they had 3 mD to get to the debriefing area, and then one at 4 mD before 47 cD telling them they should be in the debriefing now. At each of these debriefings, each of the 12 members of the research team would have about 1/3 mD to review what they had learned that night. This would get them out and in their hammocks to rest just as the sun broke the horizon and the temperature really shot up.

However, today was different. Today was the last day of this incredible research expedition. The first warning went off at 43 ½ cD to tell them the team they had 10 mD to do a final pack up and bring all their equipment to the front. At 44 ½ cD, all the research team members were expected to be up front with everything they had remaining inside, never to enter again – at least not this winter. Then while the ship’s crew was loading their belongings for the journey back, each team would each have a full 10 mD to give a summary review of their finding for the entire expedition. Of course, this was just a summary for their onsite colleagues; each would be expected to write a full publishable article on the 3 dY trip back, as well as work with everyone else to do a joint article that was principally authored by Professor ArtifactFinder.

While waiting for the next warning bell, the Professor looked out the entrance. To the right was their rest hammocks, and to the left, in the distance, was the ship that brought them here. They had spent a lot of time in the rest hammocks. Everyday their work shift would end at 47 ½ cD, just a few mD before the sun came up, because the heat would quickly get too oppressive to do anything.

At this far southern latitude of almost 18 degrees below the north pool, the sun would be up for almost a full 44 mD before setting again. In that time, the temperature would come up about 14 fB to about 47 fB. It would still continue to raise another 3ish fB over the next 50 mD, before it would peak and start

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<sup>17</sup> In Necedah, cD and dD were often used to tell the time of day, and mD used to describe a time window or how long until some event. 47 cD was .47 of a full day since midnight the previous night.

cooling again. However, the inside of the structure would continue to warm even longer – it was as if it had been built to absorb heat and keep it in as long as possible.

So everyone had to pretty much just lay in the hammocks and endure the heat each day for about 400 mD. The hammock area was shielded by heavy canvas to the south to keep the sun from shining directly on the expedition, and the entire area was fitted with misting tubes that would run for their rest period after being refilled by the ship's crew during the night. During this rest period the members would just drink massive amounts of water, get what cooling they could from the misters, sleep when they could, and maybe write a few notes if they were able.

That would continue until about 87 ½ cD, when the outside temperature had cooled down to about 42 fB, and they would get up to start their research. Soon the heat would be livable inside the complex too, and the teams could start their inside work as well. They would then work all night until the next mid-day, and the process would start all over again.

It was never cool. It was not even ever warm. It was always hot. The only difference was how hot. This was the depths of Winter. No one could imagine how anyone could possibly live here in the summer months when temperatures reached around 60 fB.

Professor Artifact Finder then scanned over to the left side of the open entrance view and noticed the ship that had brought them here and recounted how they had come to know about this place. The ship itself was an impressive sight to see; a marvel of innovation and science. It was a joint project of South Central University and Power Systems Corporation. While the new solid fuel burning steamships has been dominating new ship building for the last 15 years or so, this ship was based on an entirely new technology – steam turbine engines fueled by a liquid petroleum energy source. Christened *Long Distance Research Ship 1*, or LDRS1, it had been designed strictly for, of course, long distance research. It was of a long, wide and low construction. The front 95% was reserved strictly to store the new fuel. The rear 5% housed the 5 steam turbines and 5 screw drives. With all 5 engines going, it could maintain speeds of almost 20 KL per cD (KLpcD)<sup>18</sup>, just slightly faster than clipper ships with the northerly tail wind behind them. The large fuel store meant that it could travel almost 100,000 KL, by design, without refueling, which was about 16 times further than most of the current commercial steamships. Moreover, the replacement of solid fuels that had to be shoveled, with liquid fuel that could flow in via mechanical pumps, meant a vast reduction in labor and ship's crew. The reduction in crew quarters

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<sup>18</sup> 20 KLpcD ~ = 28 MPH (1 MPH = .705 KLpcD)

also reduced the weight, wind resistance and needed food stores. In the end, although it was a very large ship, there was only 8 beds available for researchers, and 12 for the ship crew.

But the most distinguishing feature was that while LDRS1 could do a little better than Clipper Ships when going with the Northerly tail wind, when going against the Northerly wind, the clipper ship was doing maybe 7 KLpcD<sup>19</sup>, LDRS1 could still do the same 20 KLpcD. This was massively significant for a research ship.

In Necedah, the prevailing winds were from the north-northwest. In the inhabitable region, the effect was fairly light, only about a 1.5 KLpcD average wind speed. But once you passed the End-of-Rain-Line, the average wind increased to about 14 KLpcD. Professor ArtifactFinder had no clue why this was and made a mental note to ask his friend Professor Emeritus BluestoneCutter when he got back to SouthCentral University. But nonetheless, since the considerably warmer temperatures south of the End-of-Rain-Line gave only about 4 dY in the winter months to explore them before it became too hot, this meant that Clipper Ships could only make it about 20,000 KL south in a little over 1 dY before they had to turn around and start making the relatively slow journey back north over the next 3 dY before the weather got inhospitable. However, LDRS1 could make it essentially twice the distance, or just shy of 40,000 KL before having to turn around, since it could go at full speed in both directions.

Last year was the maiden full research voyage of LDRS1. Throughout almost the entire trip, they had seen nothing but a continuous shoreline with an almost imperceptible curve which looked the same, KL after KL, after KL. As LDRS1 made its way down the coast, it found that the second 20,000 KL looked almost identical to the first 20,000. It had started to look as if the entire endeavor of building a highly expensive specialized ship as the LDRS1, had been a complete waste of resources with nothing new to discover. Nothing except, of course, to confirm that it did get hotter and hotter as you went further south.

As it was anchored at what was supposed to be its most southern point before it turned around, the morning survey lookout spotted something unusual on the southern horizon through his distance scope. It was a bump on an otherwise monotonously flat and continuous horizon. But there was definitely something there; something different. So being an explorer, the ShipMaster committed a serious breach of protocol and instead of turning around today, as he was instructed, he went another day

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<sup>19</sup> 7 KLpcD ~ = 9 MPH

south to encounter the whatever the bump was. And as he arrived, he felt as if it was entirely worth it, regardless of the consequences.

In the middle of nowhere, after nearly 40,000 KL of the same dune-beach-ocean landscape, KL-after-KL, for thousands and thousands of KL, before them was this large stone structure sitting atop a round knoll. The round knoll was sitting right on the coast. To the west, half of the knoll was facing open ocean. But to the east it was surrounded with what looked like a semi-circular trough or moat around it which was filled with ocean water, giving it an almost storybook look. The trough was wide and appeared deep enough that the ship could have entered the channel.

But the ShipMaster was having none of that. He was going to stay in the safely deep water to the northwest of the knoll. Meanwhile, he was having the photographer take as many pictures of the structure as possible within the hot but short winter day. After a while, the ShipMaster moved the ship to the direct west of the structure, then to the southwest, so that a better set of photos could be taken, but he refused to enter the trough; that would have to wait for a future trip.

They made anchor there that night. The full moon that night made for an eerie sight of the silhouette of the structure against an otherwise two-tone background of the desert and ocean.

The next morning, they steamed north as they were supposed to 2 days before, and with the day given up going south rather than north, they were a full 3 days behind schedule, or almost a 1/3 dY. For the next 1 ½ dY they continued north a full speed. During the journey everyone documented what they had seen, in as much detail as possible. The photographer developed his photos in an improvised dark room and shared them with the rest of the crew to discuss what they had discovered. Nothing like this had ever been found before. Sure, there were small trinkets and plates and pottery that had been found in the deserts near SouthEast City over the years and sold to certain museums and important families, but nothing even close to this. Everyone looked forward to discussing this with the rest of the history faculty when they returned to SouthEast University and making sense of what they came upon.

Before they made it back to port, they were intercepted by some merchant steam ships that had been dispatched to find them, seeing as how they were more than 2 days late returning. So by the time they made it back to SouthEast City, they had a small caravan escorting them, making it almost a parade like scene, with a small crowd welcoming them back.

As soon as they made it to port and starting sharing their stories and photos with the press, the mystery structure 40,000 KL below the End-of-Rain-Line quickly became the talk of the town, with all sorts of

theories and conjecture of how it came to be, but the history department of SouthEast University was largely silent, because they had no plausible theory for why a large stone building, that was miserably hot in the winter, and unlivably hot in the summer, would exist there, especially since before the last year people couldn't even make it there from the inhabitable area.

Based on all the academic and public interest, in a matter of days it was announced the ship would make a second journey again next year, but this time leaving a full 7 days earlier and returning 8 days later, which would give it an extra 1.5 dY of research time. The specifics of the journey were light, but the eyes of the entire SouthEast region, and soon to be all of Necedah, would be on them to come up with answers. And so was borne the expedition Professor ArtifactFinder now found himself immersed in.

Returning to the present, Professor ArtifactFinder lost focus on LDRS1 and widened his peripheral vision, only to notice Nart ShipMaster standing outside the entrance at a distance and smoking a pipe. The professor had not had high hopes for Nart when he had first met him. Much the opposite.

Professor ArtifactFinder's first impression of Nart ShipMaster preceded even meeting him. For years Professor ArtifactFinder, while both teaching History at SouthCentral University and heading the department, had been courted by SouthEast University to do a 2-year professor exchange program where he would teach a special Artifact History course. There was no doubt that Professor ArtifactFinder was attracted to the offer. He had grown up in the SouthEast City region, and his family name came from there as well. His ancestors, or course, found artifacts and sold them to the university and important families. In fact, most of the artifacts he would be lecturing about would have been collected by his father, grandfather, and great grandfathers.

Last year he had agreed to do the exchange and had been excited about it. He was treated very well by the University. He was given a place normally used by an Emeritus Professors, and the department pretty much let him handle his class as he saw fit, including any excursions he wanted to do. He was also allocated about 30% of his time to research, and he could do whatever research he wanted to do (or, quite honestly, do none at all, should he so choose). They never made any demands on him or supervised his class work. They treated him with deference and respect.

That is why he was so taken aback when last summer he was unceremonially summoned to the chancellor's office without warning. When he arrived, he found there, besides the chancellor, the Chief Servant of the SouthEast City, as well as someone from the local office of the Necedah Interior Ministry.



Without any fanfare, they immediately got to the point. Even though he was a visiting professor, this was bigger than just their university, and based on his experience, skills, and discipline, they wanted him to head up the research expedition – his knowledge of historical artifacts and heading the history department at SouthCentral University made him the most logical choice. Moreover, he would be able to pick his team. However, this all came with one non-negotiable condition: while he would be in charge of the research team, the ShipMaster would be in charge of the overall mission, and that ShipMaster would have complete control over all safety concerns, when they got there, and when they left. In fact, to underscore how core this was, they made it clear that if he so much as suggested to the ShipMaster they lengthen the trip, he would void his tenure, and he would be immediately released. This was a highly unusual trip, with many, many unknown risks, and the safety of the entire party was paramount, and the ShipMaster would be charged with the responsibility for that.

Professor ArtifactFinder was astonished that he would be given this opportunity, while at the same apprehensive of the directness of the offer and sternness of their non-negotiable condition. Still, this was likely the most important research mission in known history, and he was almost in disbelief that they had offered the job to him. So, he gladly accepted and asked when he could meet the ShipMaster.

Knowing that as soon as it was released that Professor ArtifactFinder was going to lead the research teams he would become an instant celebrity whom the press would hound, they had already setup a meeting for this evening at a relatively small and obscure pub in a residential neighborhood near the South Ocean. He was given the time, address and directions, and politely asked not to be late. They also let him know that the person selected to be the ship ShipMaster was a certain Nart ShipMaster.

The ShipMaster professional family was once a noble, respected, almost autocratic professional class. A couple hundred years earlier, they were almost a separate political structure upon themselves, ruling the seas and all that happened there. In port, they would routinely be invited to high-raking social events and often be a powerful voice in political issues that involved the ports or sea commerce.

But since then, with the advent of a better highway system, and increased cargo hauling capabilities, their status had waned. Sea commerce was still very important but was now more of a commodity with a viable substitute available, especially with the advent of steamships which could be operated with a much less skilled crew. As such, when in port, ShipMaster members were now much more likely to be seen in a dark pub drunkenly boasting about their exploits, then at a society event discussing politics with the local power players.

Later that evening, Professor ArtifactFinder made it a point to be 10 mD early to their scheduled meeting spot. When he got there, he made his way to a back table and asked for a hot tea. While waiting, he noticed a group of about 15 sailors sitting at the bar, carrying on somewhat noisily about the journey that was in front of them. In between talking about the challenging tasks on this new ship, they could be heard giving salty barbs and insults to each other in a way that only close shipmates would do.

One of them in particular seemed to be the butt of many of their jokes, and he'd just laugh it off, look down, and take another drink as if he was not worthy of respected enough to even return their fire. Professor ArtifactFinder assumed from the interaction that he was a lowly deck hand, the unfortunate person whose gifts had left him at the bottom of the social pecking order.

As soon as he saw the Chancellor and the Chief Servant walk in with a couple administrative staff, he joined them and set down with them in a private room. When he saw the person who had been the butt of those jokes join them at the table and be introduced as Nart ShipMaster, he hoped no one saw the disappointment, shock and dismay on his face. As the meeting went on, the ShipMaster was quiet, largely speaking only when asked a question. His answers were always professional and to the point. A few times he did interject when an idea or plan was being discussed that had a flaw or unforeseen consequence. These interjections clearly showed a keen grasp of his knowledge of the seas, but his lack of general interaction seemed to be a sign of his lack of confidence or the fact that he may have been drinking too much. To Professor ArtifactFinder, Nart seemed demur, weak, disrespected, and possibly a drunk, certainly no one to be in overall control of such a vital scientific mission.

Professor ArtifactFinder never saw Nart in a social setting again, but at the many planning meetings they had before the trip Nart did nothing to assuage his fears. Professor ArtifactFinder had voiced concerns to the Chancellor but was succinctly told he should focus on the research team planning and not the ShipMaster.

So Professor ArtifactFinder was understandably concerned when sailing day came, and Nart ShipMaster showed up with his crew of 11 hands. But as soon as they were underway, it was as if Nart became a completely different person. He stood up straighter, walked more purposefully, never lowered his eyes when talking to someone, and spoke forcefully to all his crew with the undertone that if you did not fully and completely implement his instructions, there would be a big price to pay.

Once when the ShipMaster came on the deck and barked out an order to one of the younger crew – a crewmember who Professor ArtifactFinder remembered from the bar on the night he first met Nart but

was reportedly new to Nart's crew – as the ShipMaster turned to walk away, the young crewmember muddled under his breath something about that being a waste of time. The ShipMaster flew around to the young crewmember and gave him a backhand that sent him almost halfway across the width of the ship. The ShipMaster then rushed to the downed crewman.

At first Professor ArtifactFinder was aghast, almost in shock. Violence was almost unheard of in Necedah. He had never seen or nor knew of anyone who had seen an adult strike another adult. While he had occasionally heard wild tales, and most of them tales from ships at sea, he hadn't ever heard of a credible story of violence except for one time in Northern Nechadah, and that was a long time ago.

So surely, he thought, when the ShipMaster rushed to the downed sailor, the ShipMaster was going to check on his welfare. But instead the ShipMaster grabbed him by the shirt with one hand and lifted him off the deck, bringing their faces close together, and then quietly said "If you ever question or delay my orders again I will throw you overboard like the others." Letting the young sailor plop down back on the deck with a thud, he then turned and headed back towards the stairs. The rest of the crew waited as the ShipMaster walked back. It first appeared to Professor ArtifactFinder that they were doing this out of shared shock at what they saw; but then realized it was out of deference for his command.

As soon as the ShipMaster disappeared, the rest of the crew hurried to the young crewmember's aid. After making sure nothing was broken, Professor ArtifactFinder heard one of his more experienced shipmates tell him, "The ShipMaster knows what he is doing. In an emergency, there isn't time for him to explain. If you hadn't rigged that down right and the ShipMaster has ordered a quick turn, that could have come lose and killed some of us." The rest of the crew also were quick to tell him that no one wanted the ShipMaster to "start throwing people overboard, because once he starts, he can get carried away".

Professor ArtifactFinder didn't know if the ShipMaster had even ever thrown a single person overboard. But he did know that no one else ever again objected to the ShipMaster's orders, and the entire voyage was one of the smoothest operations he had ever seen. Even the drills and training the ShipMaster insisted upon throughout the trip, instilled confidence in all the research team that they were in the hands of a highly skilled, highly effective sailing crew, all directed by a seasoned professional ShipMaster.

Returning to the present, Professor ArtifactFinder then noticed Nart starting to come inside the building. In all the time they had been here, Nart had never ventured into their morning debriefings. He hoped that the ShipMaster might actually be showing a little interest in what they were here to accomplish.

“Good Morning Professor,” Nart said as he came closer to Professor ArtifactFinder. “Good Morning ShipMaster” the professor returned.

“Professor, I’ve been meaning to ask you. I understand your family line is from the SouthEast City region. That’s more or less been my home port for most of my life, yet I’ve never heard of that profession line before.”

“Completely understandable ShipMaster,” the professor retorted. “The market for artifacts is very small. The SouthEast City region is the only place that there is any market at all, and then only enough for 1 or 2 sellers. I had heard stories that some of my ancestors would go as far as moving to falsifying a new family name and learn a new trade rather than compete in such a sparse market. In fact, I was the last one who made a full time living at doing that, until I gave it up when I was still fairly young to become a full time academic.”

Nart shook his head in agreement as the Professors words trailed off.

The other members of his research teams were now streaming back into The Map Room - 3 teams each with 3 members - all of them carrying some gear with them and placing it near the door for the ship crew to load onto the ship. As the last of the team members were coming in, Nart said something to the professor that caught him off guard.

“Professor, I’m sorry I’m making us leave 3 days early, especially after getting here 2 days late. But getting here earlier in the season caused it to be too hot to run all 5 engines, and I had to cut it down to 3 the last bit of the leg down here. The temperatures are going to start rising each day soon, and I can’t count on using all 5 engines until it gets cooler. Should I only be able to use 2 engines, the temperature will rise faster than we can make it north to cooler weather. And in that case, we all die, and no one will know what you have learned.”

Nart concluded the sentence as if he had told him he wanted more sweetener in his tea. Very matter-of-fact and without inflections to match the gravity of what he was saying. But the professor accepted that Nart knew exactly what he was talking about, and trusted that he was making the right decision.

Professor ArtifactFinder noticed the groups had informally gathered now and were more or less looking at him to start the expanded briefing. As he normally did, he made his way to the far side of the map room and stood in front of the Map as he prepared to address the group. He heard the second warning bell go off, just as he turned around, only to notice that Nart was still standing there, apparently with the intent of listening in. The professor couldn't help but crack a little smile that the ShipMaster showed some interest in their research.

First on the docket was the cultural history team, headed up by Professor HouseFramer, who was assisted by two of his promising graduate students. Professor ArtifactFinder, nodded to Professor HouseFramer, who jumped right in to his summary debriefing.

"Thank you Professor ArtifactFinder. Here's our summary of the furnishing, art work, and cultural architecture of this building. To start off with, the furnishings, while highly degraded now, all appear to be similar to 15<sup>th</sup> century furnishings. They are made mostly of wood with crude iron junction anchors. The wood appears to be of a very high quality solid hardwood. However, we have not been able to tell the species of the tree. It appears similar to the SouthEast Oceantop, yet has some distinct differences. It is almost as if we are looking at a wood species that is now extinct. I should also mention that, while this place is next to the Ocean, the almost constant North-Northeastern wind keeps it very dry here as the air moves slightly from land to ocean, never allowing the humidity of the ocean to come onshore. This has allowed parts of the wood, while now extremely fragile and weak, to become almost mummified.

"Moreover, our survey of the building suggests that although some of the debris piles look disheveled, in actuality all the furnishings appear to have been very neatly positioned and put in their place, as if a cleaning crew had come through, organizing everything, and was expecting the residents to come back at any time. Yes, when items decayed and fell or created a pile, it looks ransack. But if you trace back to their source, everything was very neatly left when the inhabitants departed.

"The furnishings of the rooms suggested that this was somewhere between an inn and a communal compound. Most of the sleeping quarters had bunk beds, suggesting space was at a premium. Most of these rooms also had a small table and a couple chairs. The disproportion between room residents and chairs suggests that the tables were more utilitarian, than a gathering location; reinforcing that The Mess Hall was the main gathering area.

“After the common sleeping quarters, there were also several rooms that looked to be for couples – a larger bed with a larger table, storage bins, and what appears to be bookshelves, although I’ll let Professor BookScribe discuss that. In addition, there were also several smaller rooms that seem as if they were for a single individual. The rooms were the same depth, but about half the width. The marked difference in sleep density between the common sleeping rooms, and the couples/single rooms suggest significant wealth or status variations.

“And then there was what we called the Governor’s room. It was unique in the structure, and about the size of 6 couples rooms, with ample tables, chairs, padded benches, cabinets, etc. It was very ornate compared to the other accommodations.

“With regard to the more functional areas, The Mess Hall is the most significant. However, we have not found anything that suggests it was anything more than a common gathering and eating area. The kitchen, pantry and storage areas to its north also support that conclusion.

“What we found in the Kitchen and Pantry, were also what one would expect to find in a 15<sup>th</sup> century communal dwelling. The odd thing here is that while everything looks 15<sup>th</sup> Century, from our models of the decay of wood in these type of conditions, we estimate that this place was abandoned not 400 years ago, but about 5000 years ago.”

Professor HouseFramer attempted a dramatic pause at this point to see if anyone was impacted by this dichotomy. But at this point most of the team had seen similar discrepancies, and he couldn’t make out any real reaction from the audience, so he continued.

“Art wise, we really didn’t have much to work with. There were some signs of artwork around the complex, but all of it was almost completely disintegrated. You can make out a little of the wood artwork in this room, but there was no metal or stone artwork. So, while very regrettably, we can tell almost nothing of what these people expressed via their art.

“There is also one last item of interest. While sand has somewhat built up around the structure, it appears that if you take the sand away, the original walkway was almost 2 Ls below the bottom of the door. So, something should have been filling up that space much/most/all of the year or the doorway would have been usable.

“Of course, we will write up all of this in much more detail and give you all a chance to review it as we make our way back home.”

With that, Professor HouseFramer was essentially turning the floor back over to Professor ArtifactFinder, who then called on the historical engineering group.

“Professor YazeshoeMaker, can you give us your debriefing?”

Professor YazeshoeMaker was fanning himself and looking around. Everyone could now clearly feel the imposing heat flooding in from the outside through the entrance as the support crew was carrying out the crates of equipment. He both felt sorry for them having to work in this heat as well as grateful it was not him having to do it.

Professor YazeshoeMaker slowly started. “We, the engineering department team, the three of us, well, we’ve seen lots of odd stuff here. Of course, like all of you, we’ll write it all up on the way back. There’s much too much to go over all here. But let me share with you some of the highlights, if you can call them highlights. Maybe it’s better to call them significant findings. Yes, let me share with you the Significant findings.

“I remember the first thing we found unusual was that the water cistern – the circular recess in the northeast of the building near the northeast door – or what appears to be a door – we actually never opened it. Anyway, the water cistern. It seemed strangely small, only about some 800 mQ<sup>20</sup>. Maybe enough for a day or two when they were at full capacity – or what we think was full capacity. In an arid, hot place like this, you would expect them to be putting much more emphasize on a large fresh water supply. It was as if they were not concerned about replenishing their supply, nor with having to resupply so often. It would cause you to believe – or should I say lead you to hypothesis – that the supply was close by. But we haven’t seen any fresh water reserves since before we crossed the End-of-Rain-Line.

“Next, in investigating the cistern – we went inside and looked around – where the stone cracked in almost a helix fashion – going round and round the cistern but in a constant increasing up/down fashion. We made a small hole and found that just an inch or so behind the wall was circular hole inside the stone wall, coursing through the stone – but much closer to the interior than the exterior of the stone walls.

“We were then able to trace it back through the floors and walls to the bellow hearth near the ovens. When we first saw those bellows, we thought ‘of course, they are just part of the oven’. But they

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<sup>20</sup> 800 mQ = ~1000 Gallons (1 mQ = 1/1000 cubic L = ~ 1.977 Gallons)

weren't. No, the four bellows feed four duct systems through the walls. That is, when the hearth was going and the bellows pumping, they would have been pushing hot air through the boundary walls of almost the entire complex. And the Cistern of course. It was as if they were trying to warm the inside of the building – and the water. And why would anyone ever want to do that here?

“So that was mystery number 2. Well it wasn't actually number two – we found a lot of mysteries, but in the order I'm describing them, that's the second significant finding I'll mention.

“The one place we didn't find the heating ducts was in the pantry, food storage, and meat locker section. That all seemed to use some sort of natural exchange system. This was just the most bizarre – well, not actually the most, as I said there was a lot of bizarre stuff; maybe just very. Yes, it was very bizarre. As you've seen, this was in the northwest part of the building – at the other end of the building from the ovens/hearth – and the cistern, of course. Here, we found 4 rooms behind rooms. The stone walls between these rooms were relatively thin – only about 2 dL – much less than the 6 dL thick stone walls in most of the building. And between each row was an equally thick door with some writings on them - which I'll leave to Professor LandMarker to tell you about. Anyway, based on what we found in each of the rooms, working with Professor Houseframer to help understand what they were, each of the rooms were used for separate functions.

“The most inner room was a pantry – dried goods, spices, non-perishable canned goods. Stuff that can last for long times at room temperature. The next layer room was large containers of what looks like seed and plant pods that can be using in making bread and other staples. These usually hold up better in dry cooler environments. The next room had things like containers of milk, fruit, vegetables, etc. The type of foods that do best in a cold – but not freezing - environment.

“But if that wasn't enough to blow your mind – the next one is a dozy. First let me tell you that this room is next to the outside – on the other side of the wall is the outdoors. Second, this wall was only about 6 cL thick. These are by far the thinnest walls in the entire complex – so they provided almost no protection from the outside elements. So what did we find in there? Hooks and animal bones. You got it? Yeah. This appears to have been a 15<sup>th</sup> century meat locker – although it's hard to tell that as categorically true – I guess you could come up with other theories. But the hooks combined with the large animal bone – and we're talking almost full or half skeletons – made a compelling case.

“But why the heck would they be putting their meat right next to outside temperatures of 35 to 60 fB? Did they have some special treatment that preserved the meat better in hotter weather? And what



about the milk and other foods in the next room? Could they have had some mystery way of pulling heat out of the room? If so, maybe they used it on the entire complex. Maybe it worked so well sometimes that they had to warm the building? I don't know, it's all very confusing. Or another possibility is, .."

Professor ArtifactFinder took his opportunity as his colleague took a quick breath, "Thank you Professor YashoeMaker for that debriefing. It is clear there are many more questions than answers here. We look forward to reading your reports as you draft them on the way back."

Professor ArtifactFinder continued, "And now for the last team, the Historical Linguistics team. Professor LandMarker please share your general findings."

Associate Professor LandMarker was a very shy man. Professor ArtifactFinder found it ironic that someone who studied the history of language, would have such a hard time saying anything. Professor ArtifactFinder gave him a little nudge and flick of the hand to let him know it was time to talk to the group, something Professor LandMarker did not like.

Professor LandMarker started, "If I may please, if I could, could I..." his hands pointing in the direction of the Map on the wall, as if he wanted to go over there to talk.

"By all means Professor LandMarker", as Professor ArtifactFinder moved out of his way. Professor LandMarker then hurriedly walked to the Map, and started at it for a few moments, his back still to his colleagues. "Professor LandMarker?", as Professor ArtifactFinder inquired.

"Sorry. Let me start by saying we haven't found much to go on here. We have this map of course. There are also the writings on the doors in the Pantry area. But not much more than that. We did find that it looks like there used to be quite a few book cases here, but most of them, and their books, had crumbled and mostly turned to dust. We did discover some remnants of books that may have fallen early or were left on a stone ledge. But these almost evaporated into dust as soon as they were touched. Moreover, any lettering on the binding or outside of the books were far too faded to have any linguistics value."

Professor LandMarker, still avoiding looking at anyone by holding his eyes to the floor in front of him, then shifted some, as if uncomfortable with what he was going to say next.

"Still, this map and the symbols are in reasonable shape. To be honest, I was able to decipher them within the first couple days here; the language appears to be an offshoot of a precursor to ancient

Eastonian. But it seemed so fantastic I didn't want to share it until we had collaborating evidence; which, sadly, we haven't found. So let me go over this map.

"So first, look at the building on the knoll in the map and the wording above it. It can best be translated as 'North most building' or maybe 'Northern Outpost.'" Professor LandMarker was now able to turn around and look at the map instead of the people in the room, and he seemed much more comfortable with that situation.

"And over here" moving to the left of the building symbol on the map and pointing, "this path to what looks like the coastline to the west of the building on the map. This wording right here can be interpreted to say 'trail from building to ocean'. Of course, when outside we can easily see that this building is surrounded by water. Yet, although this map isn't to scale, it makes the ocean to be 5 to 10 KL to the west of the building.

"Next, take a look at this wording describing the trough around the building. That can be translated as 'Ancient's dig', suggesting that the trough around this knoll was here long before whomever made this map.

"This symbol here in the upper left corner of the map that looks like an arrow pointing northwest?" The professor quickly glanced backward to see if everyone was following him. "The wording there is 'Ice Reef', possibly suggesting sheet ice in that direction.

"And this path going along the coast from the south of the map to the trail from the building to the ocean, the map has it labeled as Northern Trail. The writing next to the arrow pointing down below where the tail ends on the bottom of the map says "North City"; in this case North is a noun adjunct, not an adjective", at which a few members looked at each other.

Professor LandMarker continued without pause, "And this trail that goes to the east of just a little bit then fades away, the wording at the end of the trail reads 'East Icesheet'.

"So in the end I don't have enough content to make many determinations about the structure of this language, much less what the people were doing and thinking. However, I can read enough to be completely baffled. We can see that ocean nearly surrounds us, and it is hot as an oven here. Yet the map shows the ocean KL away, and a surrounding frozen landscape. It could be that some storyteller made this map of a fantasy world he made up. Or it could be that there is something more inexplicable going on here."

Few had heard Professor LandMarker talk with such resolute confidence when in front of a crowd as they did in that last paragraph. And there was several moments of silence after that, with no one wanting to break the thoughts that everyone was contemplating.

Eventually, Professor ArtifactFinder broke the silence with “OK, thanks everyone for the debriefings. Please head out to your cots now and rest per the routine, being sure not to risk any heat stroke. The ship’s crew has just about finished taking the creates to the ship, and when they are done they will shut the front doors like they were when we got here. Later, when it cools down again, they will seal them up too, so the seal of dust and dirt that we broke when we first opened them is restored. As soon as they are done with that, we’ll pack up the rest area, go to the ship, and break anchor and start the journey home.”

And with that he headed to the door, and everyone followed starting to talk among themselves. But Professor ArtifactFinder was lost in the thought that Professor LandMarker had just indicated there might be a city to the South of here. If he could just convince the University Board to fund another, longer trip next year, and find a better way to deal with or combat the heat, that discovery might make this one pale.

Lost in thought, he almost ran into Nart ShipMaster as he made his way out. Nart gently grabbed his arm motioning for him to stay until everyone had cleared out. Once they did, he faced Professor ArtifactFinder and asked “So would you say your find here is significant?”

Barely able to hold back a chuckle of understatement, Professor ArtifactFinder emphatically stated, “Yes Nart, I would say our finding is significant.” Nart ShipMaster looked off into the distance and grimaced. “I was afraid you were going to say that”.

Somewhere between concerned and mystified, Professor ArtifactFinder asked “Why?”

“Well,” Nart retorted, “my orders were that if both you and I agreed the finding was significant, instead of returning to SouthEast City, I was to set course for a direct route to SouthCentral City and get you back for the SouthCentral Science Conference.”

The Professor’s face went flush as it also drooped in disbelief. “What?” he asked.

Nart, understanding that was a rhetorical question, let the silence hang until Professor ArtifactFinder regained his composure and could ask an intelligent question.

“I don’t understand”, the Professor finally continued. “I have never heard of someone attempting a journey like that. We will be 10’s of thousands of KL from the coast, going right through the middle of South Ocean. Do you have any idea what is out there? Do you even have the fuel? What about the time? It would take us about 4 dY to get back there and the conference is in 2 ½ dY.”

“I don’t know what is out there,” Nart calmly replied. “But you are the research head of research teams on a research ship, so I guess it will give you a chance to do more research.”

At this point, Professor ArtifactFinder wasn’t happy with Nart’s almost mocking tone as Nart broke into a small smile.

“It will be OK Professor. My crew is very good at navigating by the stars. We will have no problem navigating there. Fuel is another matter. We loaded up with as much extra as we could when we left, and that small flotilla we encountered at about 10,000 KL south of the End-of-Rain-Line was a resupply group that also replenished our fuel. We’ll make it. Just barely by my calculations, but we’ll make it.”

Professor ArtifactFinder was only slightly comforted by Nart’s plausible answers. “What about the time?”, he asked.

“That would definitely be a problem, except that we have some upgraded turbine engines that we should be able to push to 30 KLpcD, although we have never really tested it for more than a couple days of running. But we also brought 2 spare engines. So as long as we don’t have more than 2 fail due to mechanical rather than heat, we should be OK. And that should get you back just in time for your conference. I hear they have reserved the last day for just you and your teams.”

The Professor’s head was spinning, as it started to hit him. First, he was going to be able to see his friends and attend the SouthCentral Science Conference in just 2 ½ dY. But second, he only had 2 ½ dY to prepare for the biggest presentation of his and his team’s lives. So he was now even more anxious to set sail so he could start working on both getting home and getting prepared.

## Chapter 3 – YazeShepherd

Associate Professor YazeShepherd gazed into the area that was reserved for the Plain Sloths. It was just one area of the expansive and relatively new SouthCentral City zoo. Being only the second of the new class of permanent and publicly accessible zoos in Necedah, it had only opened a couple years ago. For a public hungry to know about their world, these new zoos were a great improvement over the menageries of traveling animals or private collections.

In the short time the zoo had been opened, Professor YazeShepherd found he had settled into a pattern of spending a fair amount of time there. Being that he was a professor in the School of Animal Studies at SouthCentral University, most people would not find that all that unusual. But in reality, he didn't accomplish much professionally here, he just found it relaxing and allowed him time to think without being interrupted like he found would constantly happen at the University.

Today wasn't the best day to be here. Being midday on LowSun day, there was a slightly larger weekday crowd than typical for winter. People like him who had taken this day off to have some personal time. While he would have normally found the larger crowds distracting, today he had a lot on his mind, which helped him tune out those around him.

Professor YazeShepherd's specific area of expertise was animal populations – how many there were, how many the land would support, how fast were they growing, what were their birth and death rates, etc. He had decided to pursue these studies after growing up watching his father and grandfather and great grandfather tend to large herds of commercial Yaze and seeing them toil to assure they were grazing them over large enough areas and keeping them feed a sufficient supplemental diet while getting the exercise a Yaze needed to stay healthy.

His current focus of study was the rate of growth of animal species throughout habitable Necedah. His area of study, like many others that had come into being since the start of the Age of Discovery, was relatively new. As such, there was very limited historical research, and even less historical data. Much of his particular science was based on data. However, since there was so little of it, most of the theories – really hypothesis – were based on 9 parts conjecture and 1 part facts. At this point, as much as he hated it, the discipline was more philosophical than scientific, and would continue to be until more data was available.

He felt very uneasy that a branch of science that should be based on facts was, instead, so based on what people thought. He had devoted his life to changing that; to gathering as much data as he could and make theories based on hard evidence and numbers.

Which lead him to his current perplexity.

It was widely known that there were, generally speaking, a far greater number of faster animals than of slower animals. The current wisdom was that the greater speed gave them more access to resources and opportunities, and therefore there were more of them. But Professor YazeShepherd didn't buy it. He just didn't think that made sense. Just because an animal was faster didn't mean it had more advantages than another slower animal that filled a different niche in nature. Moreover, habitable Necedah was vast, about 50,000 KL by 100,000 KL, or 5 billion KAs<sup>21</sup>, with plenty of opportunities for all classes of animals. Why would speed be such an overwhelming benefit over strength or flexibility, or natural protection, or size, or a dozen other attributes? He just didn't see it.

So, he had started looking at population size from many different angles. How did population size vs. lifting strength, pulling strength, mass, height, length, density, and a few other measures, relate to each other. He found that all of the relationship correlations were largely gibberish except for speed which clearly had a relation. He then went in the other direction and focused in on speed. He then plotted population size against short distance speed (fastest an animal could go), medium speed (how much they could travel in a day) and long distance (how far they could travel in a dY).

He spent nearly 2 years collecting data on the last two measures for a dozen different species, as no one had ever scientifically collected that data before. But it did pay off. Population Size vs fastest speed definitely showed a correlation, but was rough. Medium speed was better. But long-distance speed showed the cleanest RMS trend line of all of them. But he still couldn't really understand why.

So he then took it in a slightly different direction. Rather than population size, he looked at from population growth rates of wild animals. The populations of the fastest animals such as those of the Yaze family were thought to be essentially steady state, with the death rate roughly matching the birth rate. There were probably several 10s of billions of Yaze over Necedah. Enough so that they could overgraze entire regions causing hunger and early death among the local herds, leading an overall equilibrium to be established.

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<sup>21</sup> 1 KA = 1.058 sq. miles; 5 billion KA = 5.288 billion sq. miles (All land on earth = 0.2 billion sq. miles)

But just about all slower animals were still growing in population sizes, some quicker than others, but again usually related to how fast they traveled. But instead of looking at the absolute numbers, Professor YazeShepherd looked at the *growth rate* for the species; their percentage growth per year. Unfortunately, that was a hard number to come by. The professor had to scower the published papers and materials from all the Necedah Universities to find population estimates over time. In most cases he would only find one population size of a species recorded for the region. In many cases, none. But in a few places, he found two estimates at different times allowing for a crude growth rate estimate. In a few rare instances he found 3 or more, allowing for an even more accurate estimation.

Of course, finding this data wasn't easy. Although he had the research libraries of the close by SouthCentral University, getting the research from other Universities was far harder. Between sending the request and getting the documented studies, it could take a year or more. However, over the course of about 6 years, Professor YazeShepherd was able to get very crude growth rates of almost a one and half dozen species.

When he plotted growth rate against long distance speed, he was sickened. There seemed to be no correlation. Was all his time wasted? He then took the growth rate and compared it against all the earlier attributes: strength, size, etc. Again, no correlation. He fell into despair.

Almost out of desperation, he started looking at other comparisons. Growth rate against population again wasn't all that useful, other than you could see the decline in growth rate as you got to the near or at equilibrium larger populations. But it was enough of some relation to make him look deeper.

So, he started looking at other possible calculations that he hoped might prove interesting. He looked at the population saturation percentage vs. growth rate and population – nothing. Total mass of species versus population growth – nothing. Average annual roaming distance vs population growth – nothing.

Dejected, he went back to his growth rate vs. population size charts. As he stared at it for hours, his eyes saw nothing, but he sensed something there. Not really understanding how he logically got there, he started a new and somewhat distant relationship calculation. He took the growth rate against the population size and calculated the day-one of the species. That is, when, according to the math, there would have been just two of the species (presumably male and female). He then did this for all the species for which he had data and plotted it on a graph. Then something unexpected jumped out at him.

Of course, the day-one date for species in equilibrium was infinity. For near equilibrium species it was very long ago. And as the population sizes went down, the day-one date became closer and closer. It was as if the faster animals had been created before the slower animals. But looking at the graph, it was very clear that there was an asymptotic day-one date of about 4000 years ago. Moreover, the smoothed graph line approaching the asymptotic leveled out about half way through the species so that those had a day-one date of between 6000 and 4000 years ago. The only oddity was if you put man in this graph too. Even though man was twice as slow as any other species (even the plain sloth could easily outrun a man over a dY of motivated travel), they had a day-one date of almost 20,000 years ago, which was clearly an abnormality on the graph.

Of course, he had much better growth rate data on man, and knew how it changed over time, going back to the start of written records. He wished he had better data on the other species. If he just had a few more data points, he could be much better estimates. If he had enough data to get the first derivative of the growth rate, or the rate of change of the growth rate, he could be more accurate. It would be even better if he had the second derivative of the growth rate, or the rate of change of the rate of change of the growth rate. He felt strongly that with that data, he could much more accurately calculate the day-one date of even the near equilibrium species. But it would be many generations before they would have that much data collected to make that leap.

Nonetheless, he finally had something that laid out a mathematical reason for the different population sizes – they started at different points in time. But, of course, that was absurd. Necedah had been here for many millions of years or more. What had happened 5ish millennia ago that these populations started from scratch? And why did the slower ones appear to start more recently? Maybe it was just the data he had. But why would it be so consistently slighted?

He was very perplexed.

He contemplated trying to publish a paper on his finding and seeing if anyone else could make better sense of it. But with the SouthCentral Science conference just 2 ½ dY away, it would be much more fun to hold a local session with other interested scientist on his findings and discussing it among themselves. He was really looking forward to that conference.



## Chapter 4 - DirtMover

Graduate Student Zemp DirtMover heard the soft chimes sounding and looked up from the papers, books, graphs and charts surrounding him and studied the pendulum clock across the otherwise deserted study hall of the SouthCentral University library. “Arrg”, he thought to himself as he saw the time was 12 ½ cD. It was the depths of the night, and pretty much everyone was in the middle of a good 30 cD sleep cycle. “No self-respecting person should be awake now”, he further concluded. But with yesterday having been LowSun day, he knew that he only had about 2 ½ dY before the SouthCentral Science Conference, and he wanted to be ready to discuss his finding. If he caught the ear of the right professor, it might help get him elevated to graduate and become an Assistant Professor by next year.

In that quest, he was happy to have the resources of the central library available for him now. He had so much additional research to do and he found he could focus when working late. The central library, like all public buildings all over Necedah, was never closed. People could come and go and use the facilities whenever they wanted. Of course, staff wasn’t going to be available in the middle of the night, but anyone who wanted could come in and browse the books, they just couldn’t check them out until staff was back during the day. There had never been a problem with people not respecting the rules and thus requiring the building to be closed and locked. In fact, locks throughout Necedah were very rare. People didn’t lock their houses, even in the big cities like SouthCentral City. There were ample resources to go around for everyone and it just wasn’t a problem with people going where they shouldn’t or taking what wasn’t theirs. The only place locks seemed to be found was where you needed to keep children out of, or where there was dangerous contents that a person might innocently stumble upon and hurt themselves or others.

So Zemp was taking advantage of the open library to prepare his findings before the science conference.

Unfortunately, he didn’t quite know yet what his findings were. It was great to be alive in this Age of Discovery. There was so much more being learned every day. Moreover, there were new techniques and procedures and discoveries happening that allowed other things to be analyzed and tested and discovered. And that was the quandary he found himself in. He had been collecting soil samples for years all over SouthCentral Necedah. Some of them very long tubes that were about 6 cL wide by about 4 L long.

There weren't a lot of surprises when he first took the samples. He had first become interested in the study of geology, and specifically what the soil could tell him about geology, when he was working with his father and grandfather digging up dirt to be moved and packed in other locations. There weren't a lot of DirtMover families in the SouthCentral area, nor in all of Necedah for that matter, as far as he knew. People normally just built on the flat ground as it was. It was only very special projects that required a DirtMover, such as building a room below ground level (for what good reason he never really understood) or to build a water hole to swim in.

He learned early on that, as you dug down, the soil had a very distinct and consistent pattern, oscillating between medium brown layers and very dark brown, almost black, layers. The pattern was very regular, with the topmost layer being a full depth of medium brown dirt. There was also something odd that he always found, and which made every dirtmoving job harder: the medium brown layer just below each black layer was especially hard to dig through, as if it was denser. He found that to be true regardless of where they dug.

As he grew into his teen years, he grew to wonder why were there the color and density variations, and why were they so consistent? When he asked his dad or grandfather, their response was, essentially, "Because it is." As an inquisitive boy and being unsatisfied with that answer, he asked his teachers in school. But their normal response was a look of bewilderment at why he was even asking the question, with a retort questioning why he would even care. It was as if he was asking them why water is wet or the sun shines; it was a pointless question.

Except for one of his science teachers in his final year of standard school. That teacher had encouraged all his students to ask all sorts of questions, even those that were unanswerable. "By asking those questions", the teacher would lecture the class, "and looking for answers, even the unanswerable might eventual be answered." So when Zemp asked his teacher the question about "Why does the soil have color patterns when you dig down?", instead of being rebuffed or chastised, the teacher responded with, "I don't know. That is a very good question. What do you think the answer might be?" (After a while, Zemp found that the teacher was very good with answering a question with another question). Over that year, they would spend several post-study sessions discussing possibilities and how to potentially test them. Of course, this drove them to the relatively new study of physical geography and all the science behind that which might yield answers. He found himself checking out books from Professors of Geology who talked about things like what the snows in the north did to the grass and

other vegetation, or why the land south of the End-of-Rain-Line was made of sand rather than dirt. But none about the strata in the soil.

Eventually, towards the end of his last year of standard school, with the recommendation of his science teacher, Zemp applied to SouthCentral University rather than joining his brother to take over the family profession. When given the news, his father brashly told him that this new way of not staying in your family profession, was not only bad for society, but was also going to hurt his entire family and they would be poorer and worse off by Zemp “abandoning them” and choosing instead to go to the university to “ask stupid questions about unimportant things”. His family then, with the patriarch’s inducement, ostracized him and cast him out. He had not spoken to them since.

So now, 6 Y later, after having studied mathematics, physics, chemistry, biology, as well as the required coursework in history, literature, writing and other essential knowledge academics were expected to have, he found himself now in graduate studies to become a Assistant Professor of Geological Science. But almost as much as the validation he sought in becoming a professor to prove to his family that he had value in the world (and, although he would not admit it to himself, would lead them to accept him again and welcome him back), he wanted to know the question that had been confounding him for the better part of the last decade. So all his energy and time were devoted to this one quest, to the point where he only got about half the sleep, or about 15 cD per day, that a normal person would get each night.

Which lead him back to the stack of books, papers, graphs and charts surrounding him in an empty library in the middle of the night. He had to have some key findings ready for the science conference, but the findings from his soil samples were confusing.

From his studies of other professors’ data over the years, he did know that it was estimated that new dirt accumulated at about 2 cL per century. No one really claimed to know where this was coming from, but the conjecture was that the loose sand below the End-of-Rain-Line would be picked up in the strong southern winds and slowly redeposited in habitable Necedah from the constant northern breeze that must (it was assumed) be coming down over the pole and coming from the central part of the planet.

The brown strata segments in the soil samples were about 90 cL long. At 2 cL per century, that came out to about 4500 Y, assuming the soil accumulation was the same during the entire period. Throughout the top and current strata the consistency and chemical makeup of the soil was largely the same, indicating

the climate, supply of new soil, chemistry and biology was largely the same throughout. This seemed to repeat between every black strata, for as far back as the samples went.

The black strata segments were about  $\frac{1}{4}$  the depth of the brown strata, or about 25 cl. Unfortunately, he had no measure of how fast that accumulated, so he had no idea how long it took that strata to accumulate; it could be 100 Y, 5000 Y or 100000 Y. He just couldn't tell.

But there were other elements of the black soil that was very interesting. The physics department couldn't really determine anything specific about it. However, the chemistry and biology departments got intrigued enough that they consulted each other using microscopes and chemical analysis techniques to see what they could determine about the sample. They even used a new technology called *chemical spectroscopy* to analyze the light spectrum of the soil to tell them about its chemical makeup. What they reported back was that they believed this part of the soil had a high concentration of now dead organic biomass that exhibited signs of slow decomposition in reduced oxygen. One of the biologist said what he saw was similar to something he read about the decomposition of microscopic organisms at the far northern areas of habitable Necedah during the depths of winter. The article, so the biologist said, was from a professor at NorthCentral University, but what Zemp had sent him seemed to be, in his opinion, much longer term and with much less oxygen present, as if it had happened under a very large, air-tight, block of ice. Zemp had asked for the reference to the article, but he was still waiting for the reply. He hoped he wouldn't have to request the article from NorthCentral University, as that could take a full Y for him to send the request and receive the article copy via Yaze courier.

Of course, both the chemistry and biology departments had sent him all sorts of graphs and charts to document their findings. These were now spewn across the table in front of him and he was still having trouble making sense of what they sent. While he was a scientist, he was neither a chemist or a biologist, and it seemed like he needed to be one to understand all the data they were sending him.

But the oddest thing was the compression layers in the brown strata just under the black strata. These compression layers were about 20 cL deep and were very dense, as if they had had immense weight placed on them. They had defined horizontal layers to them and were so compressed that it was difficult for water to soak through (or a shovel to dig into them). In fact, according to the research he had done, the compression was so much that even the roots of plants couldn't take hold.

But there was one thing that seemed very out of place in the repeating strata. In all the previous brown soil strata, about the top 20 cL, or about  $\frac{1}{5}$ <sup>th</sup> of the top of the 90 cL strata, consisted of this compressed

strata, getting more compressed as it got higher. He had done the calculations, and without this compression, the depth would have been about 100 cL. The current brown layer – the one that he would walk on if he went outside - was about 100 cL but showed no signs of any the compression layers. Why?

He would keep working it, and hopefully he would have some satisfying “findings” by the start of the conference. Zemp glanced up again just in time to see the clock strike 13 cD.

## Appendix A – Conversion Tables

<b>Temperature</b>		
Necedah	Earth	
fB	Fahrenheit	Celsius
-17.8	0.0	-17.8
-15.0	5.0	-15.0
-10.0	14.0	-10.0
-5.0	23.0	-5.0
0.0	32.0	0.0
5.0	41.0	5.0
10.0	50.0	10.0
15.0	59.0	15.0
20.0	68.0	20.0
25.0	77.0	25.0
30.0	86.0	30.0
35.0	95.0	35.0
40.0	104.0	40.0
45.0	113.0	45.0
50.0	122.0	50.0
55.0	131.0	55.0
60.0	140.0	60.0
65.0	149.0	65.0
70.0	158.0	70.0
75.0	167.0	75.0
80.0	176.0	80.0
85.0	185.0	85.0
90.0	194.0	90.0
95.0	203.0	95.0
100.0	212.0	100.0

<b>Distance</b>		
Necedah	Earth	
	Imperial	Metric
<b>1 cL</b>	0.652 inch	1.655 cm
1.535 cL	<b>1 inch</b>	2.540 cm
0.604 cL	0.394 inch	<b>1 cm</b>
<b>1 dL</b>	0.543 feet	16.551 cm
1.842 dL	<b>1 foot</b>	30.480 cm
0.060 dL	0.033 feet	<b>1 cm</b>
<b>1 L</b>	5.430 feet	1.655 meters
0.184 L	<b>1 foot</b>	0.305 meters
0.604 L	3.281 feet	<b>1 meters</b>
<b>1 KL</b>	1.028 miles	1.655 km
0.972 KL	<b>1 mile</b>	1.609 km
0.604 KL	0.621 miles	<b>1 km</b>
<b>1 ML</b>	1028.412 miles	1655.064 km

<b>Volume</b>		
Necedah	Earth	
	Imperial	Metric
0.2206 uQ	0.0338 oz	<b>1 ml</b>
6.5232 uQ	<b>1 oz</b>	29.5735 ml
<b>1 uQ</b>	0.1533 oz	4.5336 ml
0.2206 mQ	0.2642 Gallon	<b>1 l</b>
0.8350 mQ	<b>1 Gallon</b>	3.7854 l
<b>1 mQ</b>	1.1977 Gallon	4.5336 l
6.2460 mQ	<b>1 cubic foot</b>	28.3168 l
<b>1 mQ</b>	0.1601 cubic foot	4.5336 l
0.2206 Q	1.3080 cubic yard	<b>1 cubic M</b>
0.1686 Q	<b>1 cubic yard</b>	0.7646 cubic M
<b>1 Q</b>	5.9297 cubic yard	4.5336 cubic M

<b>Speed</b>		
Necedah	Earth	
	Imperial	Metric
0.4379 KLpcD	0.6214 MPH	<b>1 Kph</b>

0.7048	KLpcD	<b>1 MPH</b>	1.6093	Kph
<b>1</b>	<b>KLpcD</b>	1.4189	MPH	2.2835

<b>Time</b>	
Necedah	Earth
3.8324749 uD	1 second
1 uD	0.260928 second
0.2299485 mD	1 minute
1 mD	4.3488 minute
1 cD	43.488 minute
1.3796909 cD	1 hour
1 cD	0.7248 hour
0.1379691 dD	1 hour
1 dD	7.248 hour
0.3311258 D	1 day
1 D	3.02 day
0.9837469 dY	1 month
1 dY	1.016522 month
0.8349253 Y	1 year
1 Y	1.197712 year