



Staff



Jake Norris, Editor-in-Chief

Jake is a junior from Oscar company. He hails from Anderson, South Carolina, where he graduated from Belton-Honea Path High School. He is also a computer science major. In addition to his academic pursuits, Jake serves with the Baptist Collegiate Ministry and is Oscar company's human affairs sergeant. Jake enjoys the beach and a good sitcom.



Taylor Diggs, Assistant Editor-in-Chief

Taylor, a third-year student, comes from Scotch Plains, New Jersey. She is a Political Science major and Spanish minor. She is a member of the Class of 2022 and a recipient of coveted Citadel Scholarship. Taylor is a Second Battalion legacy, as her father graduated Echo Class of '87. She is a member of the Honors Program and Varsity Women's Soccer Program. She has excelled in the classroom, receiving gold stars every semester. Taylor has recently been inducted to the political science honor society, Pi Sigma Alpha. The Citadel chapter of Pi Sigma Alpha chapter was rated top five in the entire nation out of nearly 5,000 chapters. Taylor uses her free time to pursue interests such as helping expand social equality and participating in the political arena. She plans to pursue a career in public interest law and hopes to someday help form a more perfect union.



Carleton Bailiff III, Executive Editor

Carleton is a first-class (senior) cadet hailing from Blythewood, SC. He is pursuing a B.A. in Psychology with a double minor in Fine Arts and Education. This is his 3rd year of service as a part of The Gold Star Journal Editing Staff. A member of the Citadel Honors Program, Carleton has proved himself a distinguished student-cadet being named a Star of the West Summer Scholar and a Citadel Global Scholar, earning Gold Stars for each semester at The Citadel and President's List honors twice. In addition to his studies, Carleton plays the alto saxophone in the Regimental Band & Pipes, sings with The Citadel Gospel Choir, and works as a supplemental instructor/tutor. Upon graduation, Carleton will pursue a Fulbright Teaching Assistantship in Sénégal and work toward obtaining a Ph.D. in Clinical Psychology in order to become an effective school psychologist in Title I secondary schools.



Daniel Wilkes, Editor

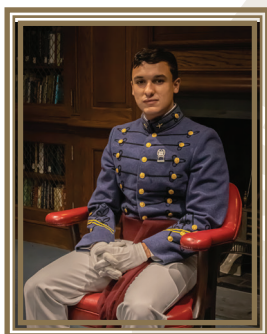
Daniel is a Senior from Romeo Company who now serves as Fourth Battalion's Academic Officer. Daniel was born in Charleston, South Carolina and is now honored to call this place his home once again. He is a Political Science and History double major with a focus on Pre-Law. Daniel is extremely involved across campus and continues to serve as the Class of 2021's Ring Chairman. Academically he is involved in the Political Science Honor Society, alongside holding leadership positions in both the Citadel's Student Council and the Citadel's chapter of the National History Honor Society. Following graduation, Daniel plans to attend a top-tier Law School where he will study to become a Public Defender.

Staff



Harrison Wedgeworth, Editor

Harrison is the Vice Chairman of Investigation for the Honor Committee of the Class of 2021. He will be graduating from The Citadel this spring with a double major in French and English, a double minor in Fine Arts and Legal Studies, and a Gold Seal from the Honors College. He has been published in SURF 2019, SEWHA 2020, and other journals. He has also studied at the graduate level through American Enterprise Institute, Pepperdine University, and Sciences Po. Upon graduation, Harrison plans to attend law school or travel internationally to pursue a master's degree through the Fulbright, Marshall, or Schwarzman Fellowship.



Bryce Garcia, Editor

Bryce, a Junior in Romeo Company, was born and raised in Miami, Florida. He is majoring in Political Science while also pursuing a minor in English. On campus, Bryce is involved in The Citadel's chapter of the National Coalition Building Institute as a trainer for new members of the program. Upon graduation, Bryce plans on attending Law School and eventually becoming a Prosecutor for the Miami-Dade State Attorney's Office.



Briona Gray, Editor

Briona is from Beaufort, South Carolina. She is a member of Charlie company and the class of 2021. She is a criminal justice major. She plays on the Citadel Women's Rugby team. She has always wanted to attend The Citadel because her mom inspired her when she attended the undergraduate program. Briona plans to go into the Air Force after graduating and then, after serving 20 years, join a government agencies.



Dr. Suzanne Mabrouk, Advisor and Founder

Dr. Mabrouk has been teaching chemistry at The Citadel since fall 1993. Her areas of expertise include organic chemistry, introductory chemistry, and the chemistry of art. She enjoys helping students learn chemistry and working on *The Gold Star Journal* with each group of editors.

Disclaimer: The views and opinions expressed in this publication are solely those of the authors and editors. They do not necessarily reflect those of The Citadel.

Letter from the Editor

Celebrating Twenty-Five Years

Dear Reader,

The Gold Star Journal has served as The Citadel's sole research journal for twenty-five years. In 1997, a group of Citadel Cadets joined together, under the tutelage of Dr. Mabrouk to establish the publication. The founding editors are Bradley B. Moorer, Joshua Jenkins and Christopher McFarland. According to the first Assistant Editor-in-Chief, Joshua Jenkins, (class of 1999) the purpose of the journal is to provide students from all academic fields the opportunity to publish their work. In this endeavor, the Journal has succeeded. Since its inception, The GSJ has published 153 academic papers. Similar to publications across the country, The Gold Star Journal (GSJ) has adapted over time. Technological advancements have allowed the editors to modernize and evolve the journal and the operation. The use of the Adobe InDesign software has provided recent editors with the ability to apply their own creativity to the layout and appearance of the publication.

An important aspect of The Citadel experience is the opportunity to lead one's peers. The Journal embodies the "Corps runs the Corps" mentality. Editors of The Gold Star Journal gain the valuable opportunity to collaborate, to learn, and to think critically. Editors are required to step out of their area of expertise by learning design software and examining new academic disciplines. Former editors look to their time with The GSJ as an experience that is applicable in their daily lives. Former author and Editor-in-Chief Miguel Parrado (class of 2016) states, "I learned to edit papers, work in a team, develop and advertise a product. I am a Navy JAG now. Whether I am working on motions for court or legal arguments it is often a collaborative effort. How do we get the right phrase or right turn of phrase is something I experience everyday. This type of work is very similar to my experience as a GSJ editor". To celebrate the 20th edition of the journal, the first conference was held to showcase student submissions to The Citadel community. An annual lecture has become a tradition that requires editors and authors to enhance their public speaking ability. The Gold Star Journal has evolved to become more than a collection of papers. Since its first edition, the Journal has expanded its content, the 2006 edition was the first to celebrate meaningful and insightful photography submissions. The inclusion of photography provides cadets with the opportunity to showcase their passion. This edition's cover photo was taken by Cadet Dashawn Costley.

The Gold Star Journal is cross-disciplinary by nature. Biology, English, History, Mathematics, and countless other academic disciplines can be captured in a single issue. Former editors and authors benefit from this diversity of disciplines, as do the readers. Recent graduate and former editor, Grant Miller (class of 2016) noted, "Editing forces you to reevaluate your own writing skill; you adopt a critical lens. Cross disciplinary perspective is very helpful. This helped me in a professional setting because often my work at the DEA was fact based and very sequential."

The Gold Star Journal has become a staple of The Citadel community. Participation in its completion is often the highlight of the cadet experience. Editor Joshua Jenkins recalls that "[the GSJ] was a way to break through the monotony of the routine like shining shoes, going to the mess hall, etc. It's important the cadets have a variety of opportunities to get out of their comfort zone. The Gold Star Journal provides something new and a challenge." For other participants the publication has become another component of their family's Citadel legacy. Past author, Matthew Holmes (class of 2016) recounts that his older brother (class of 2013) was published several years before him. His brother's achievement sparked the competitive drive within himself. Holmes reflects that, "It was through him that I put my name in the hat to try and get published." In 2011, the addition of a cash prize for Best Overall paper has increased the excitement of the author experience. In 2019, Dr. and Mrs. James F. Boyd established The Gold Star Journal Excellence Award, which provides funds to accompany these six possible awards: Best Photograph, The GSJ Distinction in Photography, Best Undergraduate Submission, Best Graduate Submission, Best Oral Presentation, and The Boyd Family Distinction Award. Jacob McKewn Williams is the 2021 winner of the Best Photograph Award for his artistic photographs. Chase Robert Ervin is this year's winner of the GSJ Distinction in Photography Award for his unique photographs.

Involvement in the creation of this publication, whether as a photographer, author, or editor, provides students with the opportunity to develop more as a scholar and a professional. The GSJ embodies The Citadel's dedication to student development as well as academic excellence and integrity. As we celebrate twenty-five years, we acknowledge that this would not be possible without the countless students that have left their mark. To leave your mark, submit your paper or photograph at: citadel.edu/gsj

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German War Graves: A Tragic and Somber Reminder of Cost of War

Nick Fricchione



Nicholas Fricchione, a senior from Harrisburg, PA, is November Company Commander. Nicholas is a History Major with a minor in War Studies. He has maintained a 4.0 throughout seven semesters, earning Gold Stars and Dean's List in each one. He is a four year Army ROTC Scholarship winner and will commission as an Infantry Officer upon graduation. He is also a member of the Honors Program, Phi Kappa Phi Honors Society, and Catholic Campus Ministry. Following his military career, Nicholas also plans to attend graduate school to earn a doctorate in History and either teach or work as a museum curator.

Abstract

This paper investigates the history of American, British, and German war cemeteries of the First and Second World War. It compares and contrasts both the purposes of these cemeteries and the physical construction. This includes the design, architecture, planning, and philosophy behind each country's cemeteries. Also discussed is each country's war cemetery organization including its origins, goals, and practices. Ultimately, it is determined that while these cemeteries fulfill the same purpose, they were built for distinct reasons: the Allied cemeteries celebrated the sacrifices made for a noble cause while the German cemeteries emphasized the camaraderie between servicemen and universal human suffering.

The Second World War caused massive challenges to all sides. It was an unprecedented conflict in terms of men, machines, logistics, and production. It also produced a previously unfathomable amount of death. Each country had to identify, bury, and honor, and use different practices in regard to their dead. The Americans, British Commonwealth, and Germans wanted to portray different aspects of national memory in the way their soldiers were buried. Although these nations' war cemeteries were built to fulfill the same purpose, they were made for distinctly different reasons: The Allied cemeteries celebrated sacrifice for a noble cause while German cemeteries emphasized the camaraderie between servicemen and universal human suffering.

The British Commonwealth's history of military cemeteries has its origins in the First World War. They largely came to be under the supervision of one man, Fabian Ware. Ware had been the editor of the Morning Post, a pro-imperialist newspaper before the outbreak of the war. He had spent the majority of a decade trying to warn the British of impending war with the Germans, but to no avail. When war broke out, he joined the British Red Cross, despite being in his mid-forties. ¹

Ware was born in Bristol on 17 June 1869 the son of a member of the Plymouth Brethren community and his schoolteacher wife. The Brethren were a particularly strict Calvinist sect that took Ware years to break out of intellectually. He spent most of his adult life emphasizing his seapartation from that world which aided his perspective greatly in later years. He eventually became a schoolteacher and private tutor before landing a job at the Morning Post.² Ware's defining job would be that of an ambulance driver for the British Red Cross. He was made the commander of the Mobile Ambulance Unit operating in northern France. He enjoyed rare autonomy in his work mostly because his supervisors were on the other side of the channel. ³ Ware began his work with

British graves almost immediately. In the disastrous retreat that started the war, the Mobile Unit had to search for British wounded and confirm the dead. It was then that Ware discovered the often ad hoc and hastily made graves of dead soldiers, often inscribed with only pencil.⁴ Ware petitioned the British Red Cross for equipment and funds to correct this, and the replied in turn with paint and stencils necessary to make a more permanent mark on each grave. Ware's men would work on them while not engaged with the wounded.⁵

In addition to searching for wounded, the men of Ware's unit also searched for graves, which they now found all over the place. This included fields and even private gardens.⁶ Ware began coordinating with Lord Robert Cecil, who ran the British Red Cross, to expand the search for graves along the whole of the British line. Ware soon brought his work to the attention of General Macready, Adjutant General of the British Expeditionary Force. Macready agreed that more work needed to be done to properly mark and register graves, especially after seeing the disorganized and shoddy manner that the Army used in taking care of Boer War graves. It was this petitioning by Ware that led to his mobile Red Cross unit being designated as the Graves Registration

Commission and thus the only organization allowed to find, mark, and register British graves in France.⁷

By the war's end, Ware's commission was now setting up permanent cemeteries. After further petitioning, the Duke of Windsor officially sponsored Ware's unit in 1917 and they became known as the

Imperial War Graves Commission.⁸ More important than the graves themselves was the context and manner in which they were buried. For instance, each cemetery would have a registry that not only had a list of names, but also a frontispiece view of the cemetery, a map of the area, a description of the cemetery and its setting, and an account of the battles the dead had fought in. Headstones were standardized, but family members could choose a personalized inscription for each one.⁹ Each headstone also included a regimental badge as well as the name, rank, regiment, and date of death of the individual buried.¹⁰

General monuments were also put in each cemetery.

These were the Stone of Remembrance and the Cross of Sacrifice. The stone had an inscription picked by Rudyard Kipling, who had lost a son in the war, which read: "Their name liveth forever more."¹¹ The commission also made regulations for unknown graves. Unidentified graves were marked with a headstone bearing the inscription, "A soldier



Abandoned Chair by Jacob McKewn Williams

Known unto God”, again picked by Kipling. The inscription also included “of the Great War” or “of the 1939-1945 War” depending on when they were killed.¹² For graves that had been destroyed during the war, they included the inscription “Known to be buried in this cemetery” or “Buried near this spot” or “Their glory shall not be blotted out.” Again, these were all picked by Kipling.¹³ Finally, each cemetery also included a building that doubled as both a shelter and a chapel.¹⁴ What is key from all of these design choices is that the sacrifice of each man for their country was emphasized. This sacrifice was also equalized as no distinction between officers and enlisted was made on the gravestones. Each one was uniform. While each headstone was a monument to individual sacrifice, the two general monuments were testaments to the collective sacrifice for Britain. The registry put each cemetery’s sacrifice in the context of the war. The Commonwealth War Graves Commission made it clear how they wanted these men to be remembered: for their collective sacrifice for Britain.

The United States honored their war dead in a similar way to Great Britain. The American Battle Monuments Commission, started in 1923, did essentially the same job as the Commonwealth War Graves Commission, albeit in their own way.¹⁵ However, work started on World War I graves with the Graves Registration Service of the United States Army. They had selected sites and had begun construction on the eight permanent cemeteries that would house the 75,000-war dead. They also identified and shipped home 45,000 others to their families, as the US government had decided to give the next of kin the option of having the body of their loved one buried in France, Belgium, or shipped to the US.¹⁶ The ABMC would be in charge of, “creating permanent sites designed to foster an appropriate and orderly cherishing of memories of the dead soldiers.... [This] was indeed the business of the American Battle Monuments Commission from its inception.”¹⁷ The ABMC added the architectural and landscape features that made the cemeteries not just resting places, but beautiful and dignified memorials.¹⁸ Just as with the British, the Americans aim in building these cemeteries and their

monuments was to honor the sacrifice of the dead and make it clear that it was for a righteous cause.

This duty of monument building began in the 1920’s. The multiple meetings of the ABMC board laid out its guidelines for erecting them. For example, the purpose of these monuments was to both honor the service of these soldiers and tell their story to any visitors.¹⁹ They also decided that every monument erected would have the words “United States of America” as well as the country’s coat of arms. Their task in doing this was very important, as the eight cemeteries in Europe, the Aisne-Marne, Brookwood, Flanders Field, Meuse-Argonne, Oise-Aisne, Somme, St. Mihiel, and the Suresnes, had already become prominent points for remembrance. Even before the dead had been sorted, much less the cemeteries finished, commemorative events took place at all these sites. President Wilson had even come to commemorate the cemetery in Suresnes on May 30, 1919.²⁰ Memorial Day commemorations would continue throughout the 1920’s especially at the American Cemetery at Flanders Field, where Charles Lindbergh diverted his path to London just days after his trans-Atlantic flight to drop a bouquet among the white crosses on Memorial Day, 1927.²¹

The design of the chapels and monuments took eight years, between 1925 and 1933. They would not be dedicated until 1937.²² The chapel placement was of utmost importance. At seven of the eight locations it is at the highest point in the cemetery. They were all placed in the center of each cemetery, both to highlight the cemeteries as places of prayer and for their aesthetics. They were the crowning feature of each one.²³ The chapels also served as memorials for the unknown, bearing inscriptions like “The names here recorded are those of American soldiers who fought in this region and whose earthly resting place is known only to God.”²⁴ The names of the missing were also included in these chapels. The architects had them inscribed on stone tablets or engraved on bronze panels.²⁵ The descriptions inside the chapels of both themselves and the cemeteries they resided in hammer home the point that their purpose was not only to honor and remember the dead, but express the country’s gratitude for the immense sacrifice the dead had

made.²⁶ A typical example would be in the Meuse-Argonne Cemetery: "This memorial has been erected by the United States of America as a sacred rendezvous of a grateful people with its immortal dead."²⁷ Finally, each chapel also included lots of artwork integral to its mission of remembrance. In addition to emblems of nations and individual units, the architects engraved a large amount of depictions of both soldiers and their tools. Many of these were common items, like rifles and gas masks, while others were made to specifically honor branches of the army like infantry, artillery, armor, and aviation.²⁸ The precedents set in the ABMC's World War One memorials and chapels would continue in their work remembering World War Two dead.

The first step for the United States in repeating their work from World War I was organizing the Graves Registration units and their planning for the disposition of the remains. First, they had to accurately record all the war dead and allow time for each family to decide whether to return the body to the US or let it rest overseas. Second, they had to acquire, lay out, improve, and construct the buildings necessary for the new national cemeteries in the US for those returned. Finally, they needed to acquire the land

to build enough permanent cemeteries on foreign soil to house all the war dead that the next of kin indicated would like to remain abroad.²⁹ This meant consolidating and sorting almost 167,000 recorded burials that were spread out across 454 temporary cemeteries as of 30 April, 1945.³⁰ There was never a larger delegation of command and administrative responsibilities in the history of the Quartermaster Corps. The task ahead of them was monumental.³¹

When the next of kin had made their decision, 94,200, or 64%, of the dead were repatriated to the United States. However, all the dead were earthed from their temporary cemeteries, even those who were to remain in Europe.³² In Europe alone, that meant reburying 140,000 deceased US soldiers located in thirty-six temporary burial grounds.³³ At this point the Graves Registration units now had to coordinate their efforts with the ABMC, as they had precedence in the matters of selection, layout, and operation of the new permanent cemeteries.³⁴ These cemeteries were selected based on several criteria, including soil conditions, ability to hold

a sufficient number of graves, and proximity to major battle sites.³⁵ The ABMC reiterated its goals with these World War Two cemeteries: "They were to be tangible representatives of the United States and its willingness to fight for the cause of freedom and democracy."³⁶ The Quartermaster Corps and the ABMC eventually agreed upon twelve cemetery sites which were turned over to the ABMC after each body had been successfully reinterred.

The first design choice was the headstones themselves. This had been decided when the ABMC was designing the World War One

cemeteries in the 1920's. The stones were in the shape of either a Latin cross or a Star of David. It listed the name, dates of birth and death, unit, and the state of residence. Each one was uniform in size and in color.³⁷ The choice of the cross was deemed appropriate as it was reminiscent of battlefield crosses and signified patriotic service. The Star of David was added as an option for Jewish families.³⁸



Salute by Chase Robert Ervin

World War Two cemeteries varied in design from World War One in subtle, but important ways. The art and architecture of the memorial chapel is presented to the visitor first as opposed to the graves themselves. This is known as a threshold design because each visitor must pass through a threshold that marks the moment one enters the realm of the graves.³⁹ In addition to the names of the missing and other inscriptions, the memorial chapel includes battle maps of the campaigns that the men buried in the cemetery participated in, again emphasizing both how and what they sacrificed for.⁴⁰ The soldier's death is "visualized as a 'good' death, a noble act worthy of honor and even reward."⁴¹ Despite the few differences between ABMC cemeteries in World War One and World War Two, they both aim for and accomplish the same goal: to not only remember the dead, but to honor their sacrifice for a noble and just cause.

German War Cemeteries have a distinctly different design and purpose as compared to both Commonwealth and U.S. War Cemeteries. Like Fabian Ware and the Commonwealth War Graves Commission, German War Graves came into being under the direction of one man: Robert Tischler. He was the chief architect of the German War Graves Commission from 1926 until his death in 1959 and his touch can be seen on every German War Cemetery.⁴² Without his efforts, very few German War Cemeteries would have come into being, if any at all. Unfortunately, little is known about his life due to his adoption of the habitus used in medieval building metallurgy which stresses a joint effort over individual achievements. The idea of a cult of personality was foreign to Tischler.⁴³ Another reason so little is known about him is that an air raid destroyed the Volksbund's office in 1944 and another in Munich destroyed Tischler's personal archives. The Volksbund was the German equivalent of the ABMC. The desire to leave the imperialistic and national socialistic past of Germany behind in the post-World War Two world left Tischler undesirable as his first works were under both regimes.⁴⁴

"...but Germany used them to emphasise suffering while the U.S. used them to console those left behind with the promise of resurrection."

Tischler's work with the Volksbund, which was founded in 1919 as the non-governmental organization in charge of burial and commemoration of Germany's war dead, began with the construction of World War One cemeteries in France.⁴⁵ France had limited building height in the cemetery to only three meters in order to prevent the Germans from making any lavish monuments. They were the losing State after all. Tischler used this as a design element: he reduced and isolated specific parts of the cemetery in order to emphasize the individual dialogue at the grave. Tischler made it nearly devoid of ornamentation to express the character of the German soldier.⁴⁶

The Volksbund and Tischler's work continued following World War Two. The Volksbund cemeteries continued to vary greatly from US and Commonwealth cemeteries, even down to a basic element like the terrain.

The Volksbund specifically sought out hills that were not agriculturally valuable lands, while the US and Commonwealth cemeteries were built on well irrigated and maintained flat fields. They also continued to emphasize the individual soldier and family as opposed to the nationalism and collective thought of the Third Reich.⁴⁷ The Volksbund framed the cemeteries to highlight the individual death as being tragic and mournful in order to push future generations towards peace. It completely abandoned the idea of the soldier's death as a national sacrifice.⁴⁸

Tischler reflected these beliefs in his architectural designs. Any allusion to nationalist power is absent. Individual grave markers, simple in design, were adopted, often with three to six names on each one due to the sheer numbers of the dead. The promise of resurrection is also noticeably absent. Often the only mention of religion was a tall steel cross erected at each cemetery's tallest point. Both the US and Germany used Christian themes, but Germany used them to emphasize suffering while the US used them to console those left behind with the promise of resurrection. Tischler used this cross as a universal symbol of human suffering.⁴⁹

Another important point that the Volksbund and Tischler drove home in their cemetery design was camaraderie. The human experience and affection for fellow soldiers was crucial, despite the possible misinterpretation by others due to comradeship being an important part of Nazi ideology. Tischler represented this in the Costermano, Futa Pass, La Cambe, and Normandy cemeteries using the “comrade’s grave.” This included multiple rough-hewn stone crosses in groups of three or five with the central one taller than the rest. These comrade’s graves most often marked the remains that could not be separated and distinguished.⁵⁰

The Futa Pass Cemetery was the Volksbund’s final work in World War Two German War Graves. It was massive, containing 30,653 graves, five times that of the ABMC cemetery at Anzio. The Volksbund also had to complete the cemetery without Tischler, who died in 1959. Despite this, his influence is still seen in the work of other architects and artists. The cemetery had a narrow entrance, a Tischler hallmark, marked by a simple spiral wall, its most prominent feature.⁵¹ A huge abstract stone mosaic designed by Helmut Lander also features at this cemetery. Lander was a renowned German artist born in 1924 who reflected on his work on the occasion of his 70th birthday:

Only at the end of the war did people become aware of the guilt and responsibility for the deaths of millions of people, as well as indescribable suffering and injustice. My generation will probably have to carry this feeling of guilt around with it until the end of my life. This realization has shaped me and my work.⁵²

The guilt and suffering of a generation were poured into these cemeteries by the Volksbund, Tischler, and artists like Lander. These feelings could not be more different than US and Commonwealth cemeteries. War graves of the Second World War were massive economic, political, and social undertakings. Balancing the physical burial of thousands of men, while also doing it in a dignified and respectful manner while portraying the sacrifice of the dead was a monumental task. It was, however a remarkably different task for the Germans

as opposed to the Americans and British. Commonwealth and U.S. cemeteries celebrated and honored not only the sacrifice of their men, but also the noble cause they fought for. In the end, the Germans emphasized the tragedy of their soldiers’ deaths, the universal suffering of war, and the camaraderie of soldiers, hoping to admonish future generations to pursue only peace.

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Curiosity by Chase Robert Ervin

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Electric Car Battery Development and Analysis

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Abstract

The purpose of this report is to identify materials and design considerations for electric car battery packs, noting impacts on affordability and energy efficiencies. This report recommends battery cathode material and cell placement to make the electric vehicle perform most efficiently while minimizing environmental impact. The properties analyzed to construct an electric battery to have more efficiency while minimizing environmental impact. The material properties analyzed to construct an electric battery to have more efficiency in power, cost, safety, and life span. This report further compared an electric car to a gasoline car base on delivering acceleration while remaining energy efficient. Finally, this report examined the composition of the battery to address environmental concerns.

Introduction

Electric cars have evolved in response to competition and continued pressure on fossil fuel reserves. However, modern electric cars can perform similar to gasoline-powered cars while outperforming them in some contexts. The gasoline-powered car was once more successful because of its affordability, thereby beating the electric car, until now through material research in battery composition. The electric car became more affordable as society shifted its concerns towards the environment while still desiring the same performance. The electric car batteries still bear some environmental consequences that require mitigation. The reason for pushing electric cars into society involves fossil fuels, a limited resource exhausted by the inefficient gasoline engine. The electric car becomes more efficient when it has gained power. The gasoline engine demands more fuel to become more powerful, making it less efficient. The energy required to produce fossil fuels is much higher than the energy required to produce electric energy. Fossil fuels only has one source, whereas electric energy can arrive from various sources. The United States produces electric energy through multiple means, incorporating wind, nuclear, coal, fossil fuels, hydroelectric, etc. In contrast, gasoline cars rely only on fossil fuels controlled by a fluctuating oil price from unstable countries. Gasoline cars have attained development limitations, including fuel efficiency and performance, for a cost. They range in price values, making it easy to encounter an entry-level vehicle for an average American. For the electric car to be more competitive, it must be positioned at a more suitable entry-level price. The purpose of this report is to identify materials and design considerations for electric cars battery packs, noting impacts on affordability and energy efficiencies. This report recommends the battery

cathode material and cell placement to make the electric vehicle perform most efficiently while minimizing environmental impact. The material properties analyzed to construct an electric battery to have more efficiency in power, cost, safety, and life span. This report further compared an electric car to a gasoline car based on delivering acceleration while remaining energy efficient. Finally, this report examined the composition of the battery to address environmental concerns. Organized into five parts, section 2 describes the development history of the electric car's battery in American society. History provides information on what factors drove the electric vehicle to advance through different materials overtime while looking at their limitations from the beginning. Section 3 focuses on how the lithium battery operates. Car manufacturers use different metals and methods of producing an electric car battery, which each offers an advantage over the other's design. Section 4 describes the efficiency of producing energy for the electric car through the power grid compared to producing fossil fuels for the gasoline engine to utilize as fuel. At the same time, the environmental consequences of a lithium-ion battery are consulted. Section 5 discusses the electric car's future capabilities and how they will gradually replace gasoline-powered cars with electric vehicles in the United States.

What Advances Lead to the Electric Car Battery?

In 1780 a professor at the University of Bologna was experimenting with the reaction of different metals positioned on a frog's leg muscle. This experiment caused the frog's muscle to contract and expand depending on the various metals employed. The research concluded that the metals biologically reacted with the muscle to cause movement. In 1790, Volta's research discovered that it was not the frog's muscles reacting to the metals, but the electric current formed from dissimilar metals, which caused the muscle to move [1]. The frog's muscle was a sensitive moist conductor that moved with the electric current created from the metals. To confirm this, Volta stacked zinc and silver plates,

alternating on top of one another to affirm the electric current. Then, to produce a moist surface, he connected the metals with a salt solution cloth. When Volta touched the metals together, they created a spark [2], [3]. The first electric battery sparked interest in storing and creating electricity using mixed metals, which compelled future designs.

What invention made the electric battery practical?

With the newly encountered practice of storing energy and the electric motor's invention, the electric car was not too far off from existence. In America, in 1837, Thomas Davenport patented an electric vehicle. The battery utilized was not practical for everyday use because they did not recharge [4]. Gaston Plante, while experimenting with new combinations of materials, discovered the first rechargeable battery constructed of lead and sulphuric acid. He invented the battery in 1859, but it took many people until 1881 to achieve a developed state. Camille Faure constructed the further developed lead battery by placing lead sheets, a non-conductive substance, and dipping them in sulphuric acid [5]. These materials caused chemical and electromagnetic reactions to transpire, which formed lead sulfate on the positive plate. When an outside source applied a load, the lead sulfate would dissolve, initiating an electric current. The battery was substantially better, and even in the present, it still equips gasoline-powered cars with a method to crank their engines over [6].

What caused the rise of the electric car in America?

In America, the electric car gained popularity in the early 1890s-1900s because their quietness, ease to drive, and reliability was continually improving. One of the lead inventors for the United States was Morris and Salom, who independently manufactured each vehicle. During their progress, no two cars were alike because each car resulted in a sounder design. They named their electric car Electrobats. The first creation contained a battery

weight of around 1600 pounds, and by the end, of its development, only weighed 350 pounds [2]. However, they existed only through taxicab services. The service was only for the middle class and above and delivered a great tourist attraction due to the quiet ride and low cost. The electric car had a low environmental impact because of a reusable lead battery. Around 1900-1912 the electric car became more affordable, causing it to be 1/3 of America's driven vehicle [7]. Although the vehicle's range was not exceptionally good, the typical distance traveled was short due to the uneven roads and centralized towns. The electric car's main disadvantage was not a problem in American cities because of its centralization. Towards the end of the electric car's height in popularity, Ford Motor Company perfected a new battery design utilizing nickel and iron. This battery contained characteristics permitting an over and undercharge, which increased a battery's life by 300% while also increasing the range by 35% [8].

What caused the downfall of the electric car in America?

Around 1912, electric car manufacturing reached a dramatic reduction, bringing an end to electric vehicles "golden age." America, at this time, was developing better roads that permitted citizens to journey to distant cities. The best electric car required hours to charge and would retain a charge for 35 miles [9]. With these limitations, the gasoline car became superior for many years. The affordability difference was surprisingly high as each electric car was hand-assembled. In contrast, an assembly line produced Ford's Model T quicker, driving the cost down to an affordable price for a low-income family. With the turn of a key, the gasoline motor utilized an electric motor to start the engine. This invention made the gasoline car safer to drive and took away American's primary reason that the electric vehicle was superior [9]. The discovery of crude oil in Texas made it easier for American's to afford gas. The only limiting factor concerning the gas car's range included how much one was willing to spend to fill the vehicle up with gas. In contrast, operating an electric vehicle might not make it to a different

town and back on a single charge. American society cared little about the environmental impacts of fossil fuels until the 1970s. Regardless gasoline vehicles outperform all other alternatives.

What allowed the electric car to exist still and start to thrive again?

The electric car disappeared for a while because Americans desired to travel, and the gas price outweighed the electric car's positives. This trend remained the same until gas prices soared in the early 1970s because of the Arab Oil Embargo [8], [9]. Congress strived to make America less dependent on the Middle East's foreign oil and renewed interest in electric cars. Americans displayed no interest in the outdated electric car since there had been no noteworthy improvements for the last 60 years. For the electric car to become competitive, they made it super light, which increased the overall range and the acceleration of the vehicle. However, these gains did little to change the overall performance of the electric car [9], [8]. The car industries refused to produce electric cars because fossil fuels had made them rich, and an electric vehicle represented a failed design in history. This mindset persisted until the government started to get more involved. In 1998 California took a proactive move, requiring 2% of all vehicles sold zero emission. California gradually increased the regulation to 10% by 2003 [8]. Other states and countries initiated the same regulations, developing competition for the car industries to drive for perfection. This consumer competition obtained the electric car considerable development

How Does the Lithium Battery Work?

Section 2 conveyed the historical fabrication of the battery to the present. Section 3 discusses how the lithium battery works, comparing the different car manufacturers and their metals and methods to generate the best performing battery.

Then the performance results will explain the distinction between an electric and gas vehicle. The lithium-ion battery assembled out of various materials works by utilizing electrochemical potential energy. The Lithium atom has only one electron in its outer shell, causing it to lose its electron to become more stable. When separated, it forms a lithium-ion and an electron. This detachment is unstable, and the lithium-ion wants to connect with another metal [10], [9]. An electrolyte provides a barrier to ensure the electrons move in one direction through the external circuit while letting the lithium-ion pass voluntarily. When charging the battery, the electrons go through the external circuit. Once the electrons have arrived on the opposite side of the battery cell, the

graphite stores the electrons until one applies a load. The electron placement makes the graphite negative, attracting the positively charged lithium ions through the electrolyte to the electrons held in place by the graphite. When the graphite retains both the electrons and the lithium in position, the battery cell has fully charged [10]. To create electricity, one applies a load to the battery. The electrons are then sent back through the external circuit, making the graphite no longer negatively charged. The lithium-ions no longer attracted to the negative charge created from the electrons can depart, forming a bond with the metal through the electrolyte. The graphite coated on a negative copper sheet transfers the properties to the copper sheet. The metal is coated on an aluminum sheet, making it positive. From there, the sheets can either be folded or rolled tightly to form a cell [10], [9].

What are the advantages of different metals used in the battery?

There is a significant difference in the metal cathode utilized in the electric car industry. Some common factors of comparison are safety, cost, power, life span, and performance. To better comprehend the difference in power and size, the best lead-acid battery delivers an energy density of 50 Watts-hour per kilogram. In contrast, the best possible lithium-ion metal battery delivers 250 Watts-hour per kilogram [11]. That is over five times denser than the best lead battery. Lithium Nickel Manganese

Cobalt (NMC) is the best overall metal cathode utilized in a battery assuming all other factors remain constant.

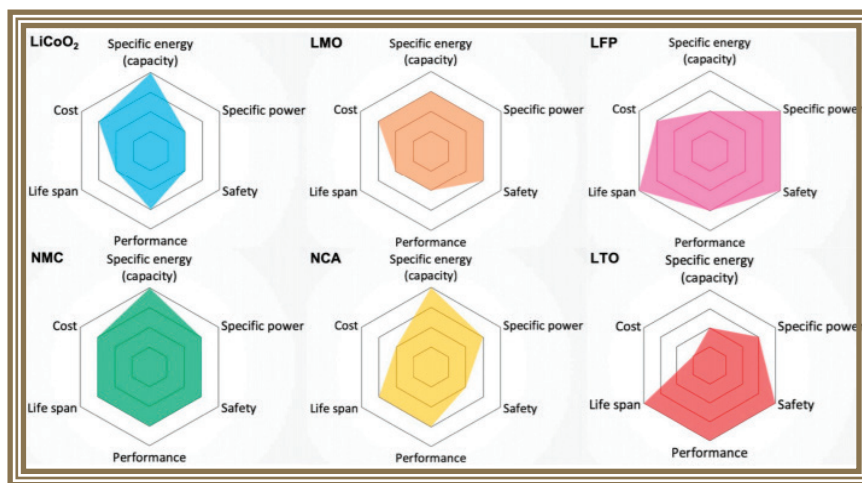


Fig. 1 Metal Cathodes Utilized in Lithium-ion Batteries. [11]

is better for a suited application. The closer the colored hexagon is to the specific topic desired, the better suited the material is for that particular application. NMC documented the most uniform inner hexagon representing its great all aroundness as all the other metal cathodes in figure 1 specialized in a certain area. No car manufacturer retains consistency with the competitors, and that is why each battery performs better with different vehicle manufacturers.

What material and method is Tesla using in their batteries?

This report discusses the top electric car manufacturers to comprehend why manufacturers utilize various cathodes in electric cars. Tesla is one of the only car manufacturers of electric vehicles that utilize cobalt with a high-performance cathode called Lithium Nickel Cobalt Aluminum Oxide (NCA). This high performance indicates that Tesla is risking some of the user's safety to get more power. Tesla claims that less than 10% of the overall battery makeup is cobalt [12]. Cobalt batteries are priced higher than standard batteries, but they have a much longer life span and a higher energy density. To overcome the battery's thermally unstable side, Tesla has designed each cell around a typical AA battery size [13], [12]. If one cell caught fire, it would be small because one cell does not contain enough energy to catch the other cells on fire. Tesla's battery pack has 18,650 cells weighing around 450kg. Eleven sections break down the battery with a separate microprocessor for each section. These microprocessors sustain the cell's ability to charge and release energy together, increasing the battery's lifespan. Another safety feature is the 50/50 ratio of water and glycol that maneuvers along the battery's surface. The battery's coolant design helps keep the cells cool when a massive load is applied [14], [9].

What material is most common in other car manufacturers?

Chevrolet, along with other car manufacturers, utilizes a combination of cathode metals for vehicle batteries. The cathode compound is Lithium Manganese Oxide (LMO) and Lithium Nickel Manganese Cobalt Oxide (NMC). These metals group together allow for an excellent thermal characteristic that Tesla NCA batteries do not have [11]. The metals are combined because LMO batteries do not have a long-life span but are known for their thermal characteristics but lower performance. At the same time, the NMC battery can store energy at a high capacity. When

these metals are combined, the batteries can charge quickly and has a high overheating value [11]. The characteristics these batteries are lacking is the performance of the NCA battery. LMO metal does not offer high performance in which the NMC metal has to compensate for [11]. The Chevrolet battery cells are bigger, making up for the loss of power. In comparison, the small cells of the Tesla battery have the same amount of power. When the cells are bigger, there are not as many cells operating in unison. When a load is applied, not many batteries cells can function together to spread the load evenly across the batteries.

Can an electric battery outperform fossil fuels?

Compared to a gasoline motor, an electric engine design shares certain similarities and competing conditions of acceleration and efficiencies. An electric motor is quite simple, with everything spinning down the main shaft instead of thousands of corresponding parts that assemble a gasoline engine. The main difference between the sports car of electric and gas vehicles is how they gain performance. In order to develop an electric car that accelerates quicker, it has to become more efficient. To produce an efficient gasoline car signifies, it will lose acceleration because the two ideas are the opposite.

The black line demonstrates the principle behind this in figure 2 with the gas sports cars with high acceleration but no efficiency while the gas high mileage car has good efficiency but no acceleration. This concept is why the gasoline car was able to surpass the electric car because it was designed with more power while getting less efficient. In the beginning, the electric car could not accelerate quickly and had poor performance because they were not efficient. Now that the electric car is efficient, they have caught up to the gasoline car's performance and surpassed many levels [15]. Figure 2 depicts the electric sports car equal to a gasoline sports car's performance while having the efficiency of a high mileage gasoline car. With the motors aside in 2017, Tesla utilized its smaller cell design to release energy more rapidly, producing a

car that would go from 0 to 60 in 1.9 seconds and would have speeds of over 250 mph [16]. Figure 2 has not kept up with the electric car's recent advances, but the electric car would be on the top for acceleration from 0 to 60 mph if it were modernized.

What is the Efficiency of the Lithium Battery?

Section 3 describes the battery components and compares it to fossil fuel performance. Section 4 compares the energy cycle between the electric grid and the manufacturing of gasoline. The creation of electric energy plays a crucial role in uncovering the efficiency of a lithium battery.

In the United States, electric energy is produced several ways, unlike fossil fuels. The electric car's energy cycle starts at getting the raw material to make energy at the powerplant, which is 97.5% efficient [9], [15]. Electric energy is then transported over the power grid to where the electric car is plugged in, which is 92% efficient [9], [15]. To transport the electric energy from the wall outlet to the battery is 60% efficient [9], [15]. The electric car's energy cycle's total efficiency is 52.5%, or 1.14km/MJ [9], [15]. On most modern electric cars, the battery can be charged through braking. This procedure is because the electric motor spins backward, which reverses the battery's load, making the battery charge quickly. This innovation adds to the electric car's efficiency cycle and demonstrates

that the more efficient the electric car becomes will allow for an extended charge on the battery [17].

How do lithium batteries compare with fossil fuel efficiency?

The power required to produce electric energy is substantially lower than the energy mandated to produce fossil fuels. The efficiency cycle starts at the production of energy and ends when the vehicles are supplied power. One of the most efficient gas cars was the 1993 Honda Civic with 21.7 km/liter

or fuel efficiency of 51 mpg. Fossil fuel engines differ widely on how efficient they are, as discussed in section 3. The efficiency cycle on fossil fuels starts at the gasoline production and transportation stage, which, on average, is 81.7% efficient [15]. It takes roughly 42 mega-joules of crude oil to produce one liter of gasoline at the gas pump [15]. This estimation implies that the overall

efficiency can be discovered by taking 21.7km/l and dividing it by the 42MJ/l to

get an efficiency of roughly 0.52km/MJ [15]. The difference in efficiency is staggering as the electric car proposed 1.14km/MJ while the gasoline motor was only 0.52km/MJ [15]. The efficiencies can vary significantly, as many factors could be considered in the overall efficiencies. Since electric and gas vehicles energies are sourced from polluting

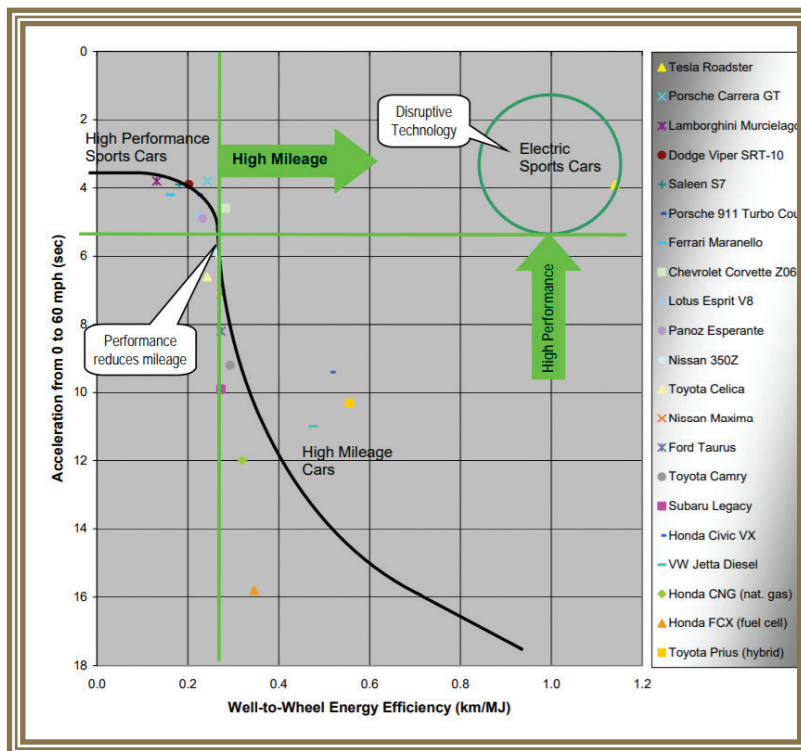


Fig. 4. Efficiency Vs. Acceleration. [15]

the air to produce energy, the more efficient vehicle would have a smaller carbon footprint. The United States also has many diverse forms of creating energy for the electric grid, meaning that electric energy does not rely on other country's supply of fossil fuels [9]. The electric energy in the United States can also be nuclear, wind, solar, coal, and fossil fuels. There are various ways to create electric energy instead of just one source of fossil fuels that the gasoline car depends upon.

What are the environmental impacts of the lithium-ion battery?

The electric car's battery pack has become more efficient, utilizing lithium-ion in-combination with various cathode metals. The environmental impacts of a lithium-ion battery are minuscule, as only 1-4% of the total battery's makeup is lithium [18]. The main component of most electric vehicles battery packs is steel, which encases each section in a battery pack. Steel properties equip it to be a practical choice because of its overall strength and high heat capacity. The battery is often manipulated as structural reinforcement for the electric car by being positioned in its overall center. The next significant material used in manufacturing the battery is copper and aluminum, described in section 3 as they are utilized to overlay the graphite and specified cathode metal to themselves. Coating the copper and aluminum with other metals gives them unique properties but also causes these batteries to be problematic [19], [20]. In the recycling process, the individual cells that go into each battery are challenging to take apart, engineered to prevent an accidental fire. Simultaneously, the steel case is the most efficient item to recycle because nothing has modified the steel internal properties. All the main components of the lithium battery can be proficiently recycled by themselves.

"In comparison, the gasoline engine has an inverse proportional relationship because as the acceleration is improved, the efficiency is reduced."

When in the internals of a battery, the individual battery cells are quite challenging to recycle due to their size and combination with other materials. The lithium-ion battery is recycled but not large enough to tolerate electric cars developing demand in American society. Although the environmental impacts are small now, recycling the battery in the future will prevent an environmental catastrophe.

Discussion

The emerging advancements of the electric car will cause it to be the primary vehicle in America. The electric car has outmatched the gasoline car due to technological advancements in components of the battery. These components have improved the range, acceleration, and energy cycle efficiency of the electric car. The electric car positively correlates with efficiency and performance, indicating that these traits increase as they become more efficient. This correlation is represented by the increase in

the electric car's range while also increasing the acceleration performance. In comparison, the gasoline engine has an inverse proportional relationship because as the acceleration is improved, the efficiency is reduced. Battery components of metals utilized and cell size differ vastly in electric cars. Lithium Nickel Cobalt Aluminum Oxide

performs better than other current battery materials. NCA has been operationalized by Tesla utilizing the cathode's high-power output with smaller cell sizes to provide more unison deliverance of power. Through scaling up manufacturing, the increased availability of these cathodes will further support the innovation of electric car batteries. A lithium battery offers more adaptability than fossil fuels because the electric grid can be powered in many different ways and does not rely solely on fossil fuels supply from transnational trade agreements.

The electric car's trajectory depends on carefully selecting and further developing cathode compounds. This innovation can be supported

by scaling up manufacturing. Through scaling up manufacturing, the cathode compounds increased availability will further support the continued innovation of electric car batteries. Developing the battery out of more commonly known materials will drive the cost down while allowing Americans of different socioeconomic backgrounds to purchase an electric vehicle. By selecting a commonly available material for a battery's production, the recycling process would permit a battery's reuse on a larger scale. The establishment of a recycling system would cause the battery to become more environmentally friendly. The electric car's limitations have adjusted slightly over its development history. Price and recyclability remain competing limitations for the battery. Tesla is developing solutions to uncovering a commonly available cathode that is easy to recycle but with great difficulty. The numerous battery design is continuing to modify, making it hard to establish a coherent recycling system. Material design innovation that strengthens efficiencies will evolve the material battery's characteristics. With the government incentivizing car manufacturers to produce electric cars, the development will continue to advance battery efficiency while keeping it economical for American citizens.

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Cleopatra: The Propagated Villain of Rome

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Abstract

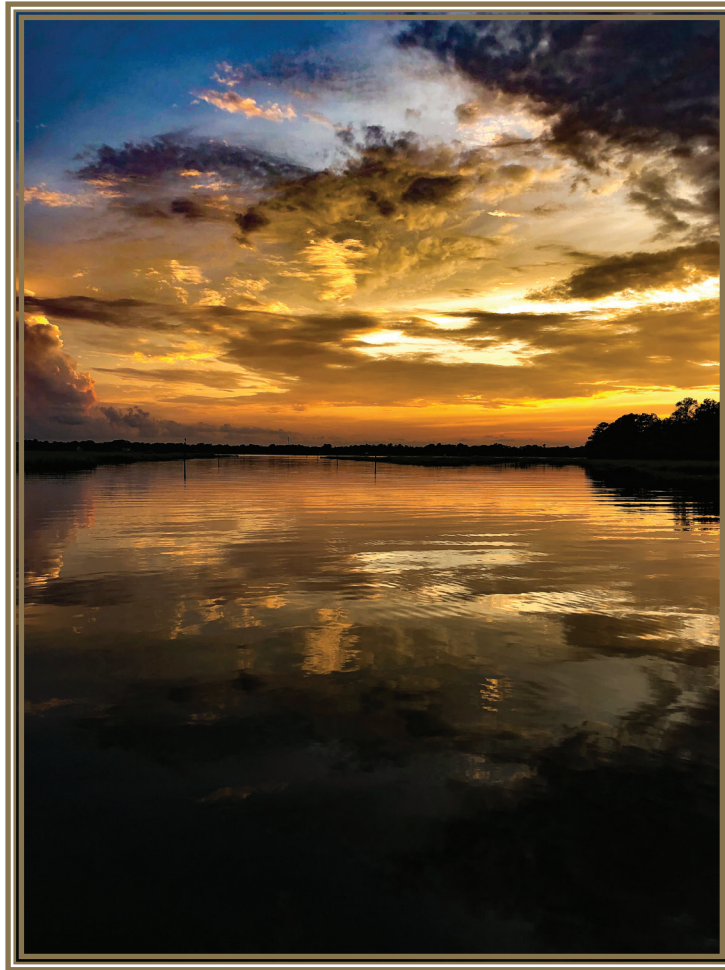
Though she may be Egyptian, Cleopatra's story is entangled within the foundations of a new period of the Roman empire. Pitting her as his political nemesis, Augustus created a worthy opponent on his rise to power, yet the propaganda that fabricated her infamous legacy failed to cement her as such a villain. Even today, Cleopatra is regarded as a political superpower, a woman ahead of her time, and one of the best female leaders the ancient world had ever seen.

With the death of Julius Caesar, war-ravaged Rome was sent into complete chaos. Marc Antony and Augustus battled for the support of the populous in a desperate scramble for political power. In the middle their conflict was the Egyptian queen, Cleopatra. Pitting her as his political nemesis, Augustus created a worthy opponent on his rise to power, yet the propaganda that fabricated her infamous legacy stains the endeavors of a powerful woman well ahead of her time.

Formulating his plan to claim political control over the empire, Augustus recognized that he would not be successful without uniting the populous behind him, which he was able to achieve solely through his ability to turn the entirety of Rome against Cleopatra.¹ Augustus was up against, truly, only one man, Marc Antony. Antony was a man who was similarly tied to Julius Caesar, as a political ally, consul, and chief aide.² Therefore, contesting this caliber of Roman man would not have been an advantageous political gamble for Augustus. More importantly, the populous would have never backed such a decision. Rome had been, for years, ravaged in a brutal civil war between the triumvirate: Julius Caesar, Crassus, and Pompey, as they all competed against one another to gain complete control over Rome. As a result, the majority of the Roman empire was in ruins. The plebes were increasingly finding themselves displaced from their farmlands, pushed inwards towards urban cities, and at a loss for food and basic necessities due largely to the degradation of the traditional Res publica that had provided the stability for the lower working class before the political upheaval of the Republic. Having watched Julius Caesar's slow fall from positive public opinion to his demise, Augustus recognized the necessity of playing to the populous, so launching a campaign against a well-liked and

This, to Augustus, who would go on to make strict legislation about appropriate relationships in Rome during his reign, was a feat belonging to that of utter savages. In fact, this hostile image of her as was continued with the description of her suicide, as the “bizarre nature [of] a death by snake presented . . . [a] portrayal of Cleopatra as an oriental barbarian . . . [as well as exemplified a] method of killing [that] was also used for murdering enemies and executing

political bargaining that took place during and after it".⁸ By displaying their relationship in this way, he eradicates the idea that she is an equal political opponent, focusing instead on her "surpassing beauty . . . [and ability to] subjugate everyone, even a love-sated man already past his prime".⁹ It is this beauty and ability to bend men to her will that leads



Sunset off the Dock by Jacob McKewn Williams

to her characterization as a wicked seductress who defiles the good Roman men around her, which is exemplified as she aligns herself with Antony. According to Plutarch, Antony's infatuation with "Kleopatra supervened, roused and drove to frenzy many of the passions that were still hidden and quiescent in him, and dissipated and destroyed whatever good and saving qualities still offered resistance. And he was taken captive in this manner."¹⁰ Thus, Augustus assimilates their relationship to be entirely sexual in nature, and emphasizes the idea that Cleopatra was able to bewitch Antony to do whatever she pleased simply by opening her legs. To further display this to the public, and exemplify how far Antony has fallen from acceptable Roman living, Augustus marries him to his sister, Octavia, for such a proper union between two elite Romans "would restore harmony and be [Antony's] complete salvation".¹¹ However, "Antony made it clear to all the world that he was swayed neither by the sentiments of a commander nor of a brave man, nor even by his own, but . . . he was dragged along by the woman [Cleopatra] as if he had become incorporate with her and must go where she did".¹² Instead of staying with his new wife and assuming the role of loyal husband, as expected of a respectable Roman man, Antony returns to Cleopatra. Such an adulterous relationship could have been swept under the rug between two equal class Romans, but Antony and Cleopatra cohabitated openly and this "obscenus" relationship became very indicative of a martial one.¹³ The marriage-like relationship with Cleopatra would be completely illegal, as Antony is legally married to Octavia, and "roman law would not in any case have allowed for a Roman citizen to marry a peregrina, a foreigner".¹⁴ Thus, all of Rome watched as he turned his back on a proper, traditional Roman woman in exchange for the attention of a seducing foreign savage. Foiled against Octavia, Augustus was able to capitalize

"However, everything historians know about Cleopatra stems directly from the propaganda that Augustus derived against her..."

on how Cleopatra, and her position alongside Antony, was a threat to traditional Roman life.

However, everything historians know about Cleopatra stems directly from the propaganda that Augustus derived against her, established through the accounts of his accomplishments on his way to founding the new Roman Empire, which severely undermines how successful and powerful she was in her own right. Before the Romans were even involved in Cleopatra's life, she was actively engaged in becoming the sole leader of Egypt, capitalizing on opportunities like claiming the Bachius to win the support of the Upper Egyptian rulers and establish political favor among her own people.¹⁵ However, she understood the absolute necessity of having a male partner reigning alongside her, securing her power and land over Egypt, and the type of man that this would need to be in order to maintain full control. Learning quickly, Cleopatra became adept at using seduction to manipulate these men into aiding her and securing their alliance, "for it was by

this device of Kleopatra's, it is said, that Caesar was first captivated, for she showed herself to be a bold coquette, and succumbing to the charm of further intercourse with her, he reconciled her to her brother on the basis of a joint share with him in the royal power".¹⁶ Yet, "in reality Cleopatra was to hold all the power alone, since her husband was still a boy, and in view of Caesar's favor there was nothing that she could not do. Hence her living with her brother and sharing the rule with him was a mere pretense which she accepted, whereas in truth she ruled alone and spent her time in Caesar's company".¹⁷ By aligning herself with Julius, she was able to gain a valuable political alliance, furthered with the birth of a recognized heir, Caesarion, who would be a viable option for the inheritance of both Egyptian and Roman power, which would have been a major political move for Egypt. Thus, she had expanded her empire through one man. His assassination left her scrambling for power, but instead of aligning herself with Augustus, which

would have been the smarter choice for Egypt, she sided with Antony. As Plutarch remarked, “Caesar and Pompey had known her when she was still a girl and inexperienced in affairs, but she was going to visit Antony at the very time when women haven the most brilliant beauty and are at the acme of intellectual power.”¹⁸ In other words, Antony didn’t stand a chance. Again, Cleopatra used her body to create a powerful alliance, gifting a Roman man with potential heirs, and receiving Roman land in return.

Yet, it was not just her body that convinced these men to align with her, contrary to Augustus' claims, as "her beauty . . . was in itself not altogether incomparable, nor such as to strike those who saw her; but converse with her had an irresistible charm, and her presence, combined with the persuasiveness of her discourse and the character . . . somehow diffused about her".¹⁹ Her intellect and education allowed her to not only keep up with these elite men but take charge. Augustus' work berates Antony for being under the control of Cleopatra and most likely, this originated from some truth. Antony entrusts Cleopatra with a lot of political control, and the appearance of her on the flip side of a Roman coin,²⁰ with her head on one side and Antony's on the other, seems to point towards a more political alliance than one of pure sexual motives.²¹ In fact, she "played a prominent role when hostilities actually began in 31 B.C.E., commanding the Egyptian fleet in person and participating openly in Antony's war council . . .

[and] Cleopatra's ships formed the core of his fleet, and . . . her wealth that paid his troops".²² It was her assets that gave Antony the opportunity to compete against Augustus and her knowledge of military tactics that gave them the greatest chance at success.

Even her death was strategic. Upon losing the Battle of Actium, she realized that with a conquered Antony, Augustus sought to drag her around Rome as a trophy of his victory. According to Horace, Cleopatra, “seeking to die a nobler death



In the Pines by William Berry Prioleau Moran

... [gathered] poisonous asps, [so] that she might draw black venom to her heart, waxing as she resolved to die; scorning, in truth, the thought of being borne, a queen no longer, on hostile galleys to grace a glorious triumph—no cowardly woman she!”.²³ This depiction of her suicide is one of a determined political leader, resolute in keeping her dignity, who refused to let Augustus have the final laugh. In fact, some Romans may have viewed this “suicide act . . . as redemptive [since] for even the most un-Roman, immoral of figures: suicide was seen as the normal ‘way out’ for those condemned or defeated in battle”.

²⁴ This interpretation was one Augustus fought desperately

to avoid, yet even through his persistent propaganda, Cleopatra's strength, resiliency, and pure political power shone through.

Though she may be Egyptian, Cleopatra's story is entangled within the foundations of a new

period of the Roman empire. Thus, throughout her life, and even in her death, she successfully navigated the convoluted political sphere and asserted her dominance in a world dominated by men, using her own resources from Egypt and her womanly assets to her advantage. In doing so, she broke the traditional role expected of a respectable Roman woman, and thus reinforced the pre-existing prejudices of Roman men, who feared the potential threat to the patriarchal order from a woman with the capability of wielding her sexuality to a political advantage.²⁵ Despite Augustus' best efforts, Cleopatra is still regarded today as a political superpower, a woman ahead of her time, and one of the best female leaders the ancient world had ever seen.

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One Belt and One Road Right Through Ethiopia?

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THE BEST
UNDERGRADUATE SUBMISSION

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Abstract

Ethiopia is currently playing an important role in the PRC's One Belt One Road Initiative that makes it not only critical for the future of mainland China but also puts their own future in a unique position as well. Ethiopia's central location in the Horn of Africa, authoritarian regime, and large reserves of cheap fossil fuels have made them subject to billions of dollars' worth of predatory loans from the PRC the affect of which is far reaching beyond their borders. Technology diffusion and infrastructure development has the potential to greatly change Ethiopia for the better or worse depending on how they decide to move forward.

Introduction

Announced in 2013 by the People's Republic of China's President, Xi Jinping, the One Belt One Road Initiative (BRI) is a massive conglomeration of investment and development projects stretching from Asia to Europe both by land and by sea.¹ Its goal is to reopen and rebuild the historical Silk Road that carried much of the world's trade for centuries from Europe through Persia and India before finally arriving in China. To undertake this project, President Xi envisions huge railways, pipelines for energy, highways, simplified border crossings, and large maritime ports. With this would come special economic zones to facilitate the transfer of Chinese goods and a significant increase in the use of the PRC's currency, the renminbi.² The projected cost of this monumental undertaking will be in the trillions by the year 2027 according to Morgan Stanley³ and by its completion will encompass nearly 65 countries across both Eastern and Western Europe, Africa, Asia, Indochina, and the Middle East. While the PRC claim that the BRI's intent is to facilitate free trade and generate more wealth, both for themselves and the countries involved in the BRI, western democracies are skeptical of this. Many of the state actors involved in or receiving BRI investment are either strategic interests or allies of the United States and there is a worry that further global entanglement with Chinese markets might shift the global power balance away from the United States and western democracy, towards the PRC and authoritarianism instead. The BRI is vital to the PRC's growing economy and, as their middle class begins to grow, cheaper labor markets outside of mainland China must be found to manufacture their goods along with more reliable sources of energy. In searching for this cheap labor, there is a distinct correlation with low standards of living and, currently, Africa is host to some of the world's poorest and most populous nations.

As the PRC's middle class explodes, the historically cheap labor markets in mainland China are now being replaced by a populace with money to spend but nowhere to spend it.⁴ By 2022, it is estimated that a whopping 76% of the urban populace within the PRC will be considered middle class, greatly reducing the percentage of the population willing to work for cheap and increasing energy demands.⁵ What this means for the PRC is a desperate need not only for reliable energy, but cheap energy, to continue steady economic growth and simultaneously continue expanding their middle class. The horn of Africa is centrally located near the Suez Canal linking the Mediterranean and Europe with the Indian Ocean and Asia; it is also near the Middle East where most of the world's oil comes from today. Outside of the Middle East, Africa is already the largest supplier of oil to the PRC already with about 1.4 million barrels of oil per day.⁶ Angola, Sudan, Kenya, and Ethiopia have all received a combination of nearly \$86 billion in government loans from the PRC over the past few years since the BRI was announced on infrastructure projects.⁷ Not accounted for in this number are the billions of dollars of private investment from Chinese-owned companies into the natural resources of these nations. Of these, Ethiopia is playing one of the more important roles in the BRI, but should they not tread carefully, the project also has the potential to jeopardize their own future.

Ethiopia's Importance

As stated above, Ethiopia is of particular interest to the PRC for a variety of reasons. Resources, location, economic ties, and diplomatic ties all connect for an ease of access regarding PRC foreign direct investment (FDI) that make expanding the BRI into Africa easier and more affordable.

Why Ethiopia?

Ethiopia is centrally located in the horn of Africa and close to the Middle East. It is a landlocked country with a landmass of slightly less than twice the size of Texas at around 1.1 million square kilometers.⁸ Of this, the Ogaden Basin in

the south east region of the country is rich in both oil and natural gas.⁹ It has seen extraction since the early 1950s but still has large untapped reserves due to a lack of proper funding, infrastructure, and technology. However, China has already started building infrastructure in the region to extract said resources.¹⁰ Poly-CGL Petroleum is a Chinese-owned company that started drilling in 2018 for oil and natural gas in the Ogaden Basin.¹¹ The earlier mention of Ethiopia's landlocked status begs this question: how will the PRC move the oil and natural gas from Ogaden to mainland China both quickly, efficiently, and cheaply?

BRI Investments

It is here that the BRI becomes vital to Chinese economic and geological activity in Ethiopia. Looking at the publicly disclosed numbers, Ethiopia has taken over \$12.1 billion in overall debt from the PRC since 2000, and investments are growing by 52% a year.¹² A major BRI investment has been the \$4 billion Ethiopia-Djibouti railway that was mainly financed via loans through the BRI.¹³ The production of the railway was a major milestone for both Ethiopia and the PRC because it connects Ethiopia to the Gulf of Aden via Djibouti's ports and connects the PRC's puppet companies and their infrastructure to Doraleh port, China's first overseas military base and seaport.¹⁴ This is now Africa's largest and deepest port and, as stated above, connects to the Ethiopia-Djibouti railway.¹⁵ As Ethiopia's population and economy grow, it is important that, like the PRC, they have cheap and available energy which presents another project being backed by the PRC and causing diplomatic turmoil as well. For the PRC to be able to get the most of Ethiopia's natural resources, natural gas especially, Ethiopia needs to be selling as much of it as possible. To free up large quantities of it for sale, Ethiopia must find its energy from another, cheaper source that would incentivize the sale of most of their natural gas.

Enter another \$4 billion construction project, the Grand Renaissance Dam; this massive hydro-electric dam would span the upper reaches of

the Nile River that is so vital for neighboring nations South Sudan and Egypt. Egypt alone relies on the Nile for 90% of its water needs and damming it is causing significant diplomatic strife between the countries.¹⁶ When completed, the dam will provide huge amounts of clean and sustainable energy and reduce Ethiopia's reliance on oil and natural gas, which then could be sold to the PRC. Because of this, the PRC has been awarded contracts to help

market forces within the country to be forced into dealing with only one country: in this case, China.

Future for Ethiopia

Ethiopia's immense natural resources and its capability for large scale renewable energy has made it an ideal destination for Chinese FDI over the past two decades. The creation of the SEZs and financing of monumental infrastructure projects



speed up the construction process and, while not funding the construction of the dam outright, a \$1.8 billion investment was promised for Ethiopia's power grid.¹⁷ The key to this facilitation and a major reason for its success has been diplomatic efforts carried out by the PRC years earlier in the creation of specialized economic zones (SEZs) throughout the Middle East and Africa. These SEZs open the door for Chinese firms and industry on the promise that PRC FDI will funnel into and assist in developing said industry in exchange for reduced tariffs and economic access.¹⁸ It makes competition from potential western investors significantly more difficult, and critics argue that it can handicap

China's Belt and Road Initiative

has created both positive and negative outcomes for Ethiopia. Whether or not the positives outweigh

the negatives, however, is up for debate.

First, the Bad

It is no surprise that the PRC has been focusing on places throughout Southeast Asia, the Middle East, and Africa for their Belt and Road Initiative. Based on data from The Economist, most of the countries in these regions are either hybrid regimes or authoritarian regimes that grant virtually unchecked power to one person or a select group of people.¹⁹ However, predatory loan

practices and contracts that last upwards of 100 years can easily be brokered by these single-person actors within state governments on the promise of riches now and consequences long after those responsible for signing the dotted line are gone.

Ethiopia is no exception and falls within this authoritarian regime category, which arguably may be part of the reason that 17.2% of Ethiopia's GDP is debt to China.²⁰ The lack of checks and balances in such governments allow for sweeping changes and grand diplomatic agreements in a short period that do not undergo public debate or input and are decided by a select few irrespective of genuine national interests. In Ethiopia's case, they have been fortunate that the PRC agreed to a restricting of loans that would see payments extended 20 years.²¹ But the circumstances of other countries, however, should serve to warn Ethiopia and provide examples on how single-party dictatorships' lack of foresight can produce dangerous results. Sri Lanka is one such nation, whose debt was converted into a 99-year lease on a port in the Indian Ocean. This gives the PRC what amounts to a naval base off the coast of their historic rival India.²² It does not seem outside of the realm of possibility that should Ethiopia default or be unable to pay at the next agreed upon date that the PRC might seize natural resources or critical infrastructure to fill the debt gap as they did with Sri Lanka. Some critics have called these multinational "shark" loans neo-colonialism with extra steps. However, these enormous amounts of FDI funded by the PRC and Chinese corporations and banks create another dangerous side effect besides possible asset seizure.

Technology diffusion, usually characterized as a good thing for developing nations who do not have the hi-tech working sectors similar to first-world countries, is important for advancing Ethiopia's economy but has ramifications beyond simply helping to develop the country's technological infrastructure. The state-owned Ethiopian telecommunication company, EthioTelecom, announced in 2018 that the monopoly would be broken up and that the 60 million mobile and fixed line subscriber base would be sold piece meal to various companies.²³ One company that secured a

large portion of this deal, and has captured much of the African cell phone market is Transsion. This company offers cheaper smartphones with multiple sim card slots that are better at capturing darker skin tones in pictures, appealing to the poorer and predominantly African population.²⁴ This, however, has been overshadowed by the fact that earlier this year 200,000 of their phones were found to have preinstalled malware called Triada, which was developed by the PRC to secretly collect user data without consent or knowledge.²⁵ This is not the only example of technology diffusion playing a role in "digital colonialism" as is evidenced by a 100-page report detailing the Ethiopian government's abuse of surveillance technology provided by Chinese tech giant ZTE.²⁶ Used to target government dissenters and journalists both at home and abroad, there is widespread evidence that EthioTelecom would violate citizens' rights by recording phone calls and using them to compel confessions from the minority ethnic group, the Oromo, which has historically been subject to government abuse within Ethiopia.²⁷

Then, the Good

It is not all "doom and gloom" for Ethiopia however, as the unique position it maintains in Africa, with relation to the BRI, has some positive side effects, too. The influx of foreign cash into Ethiopia has not gone unnoticed. This has given Ethiopia more influence on the global stage to attract investment from countries in the West who are wary of the PRC's Belt and Road Initiative and hoping to compete. There is a perception that, perhaps, Ethiopia's debt was restructured (instead of having national assets seized like Sri Lanka) due to international pressure over the PRC's increasing debt incurrence while still owing the World Bank substantial debt itself.²⁸ The massive amount of attention surrounding the BRI in recent years has given Ethiopia bargaining power not only in Europe, but in the United States as well, inviting them to mediate on the disputed Grand Renaissance Dam and encouraging FDI from American and European interests.²⁹ Regardless of whether the PRC demands an arm and a leg down the road for their previous

investments, the immediate benefits are certainly being experienced by Ethiopia. Though not yet finished, the Grand Renaissance Dam is providing large amounts of renewable energy, the construction of the Ethiopia-Djibouti railway allows for the better exportation of Ethiopian goods to international markets, and Ethiopia has consistently had one of the fastest growing economies in Africa.³⁰ This emergence of Ethiopia to the world stage spells good news for the country's minorities and citizens in general as their human rights record is becoming an important factor in attracting FDI from Western democracies which can help to spur positive change which can make the government more palatable.³¹

Conclusion

The historic Belt and Road Initiative launched by Xi Jinping's People's Republic of China has pumped absurd amounts of money into developing economies over the past years, focusing primarily on infrastructure which will facilitate the transfer of goods and resources over three continents, two oceans, and various seas. This initiative was launched with the intent to expand Chinese access to new markets for its own growing market at home and Africa has become a major receiver of the investments. This is likely due to the attractiveness of nations with massive population densities on the continent and the vast natural resources controlled by various dictatorships that are likely sympathetic to the PRC's governing style. Ethiopia has either deftly or ignorantly played into the PRC's hands, receiving billions of dollars for infrastructure projects in exchange for access to natural resources, a special economic zone, and access to the burgeoning tech market in China. In doing so, they have put themselves at risk of incurring debts they cannot repay and opened the door for creditor abuse in the form of national resources or infrastructure being seized. They have also opened the international door as western powers seek to combat the PRC's ambitious Belt and Road Initiative with FDI of their own. All of this has coalesced into a rapidly developing Ethiopia that is brimming with the potential to assert themselves as a major broker

for Africa, in relation to other nations, in the years to come. Additionally, the path to democratization may be on the horizon as well, as the infusion of such substantial capital has drawn Western eyes to Ethiopia's questionable human rights record and authoritarian government, both of which need to be addressed should Ethiopia wish to have stronger international backing against potential PRC neo-colonialism. In short, while the One Belt and One Road may be moving through Ethiopia, it is not yet clear if its effects will be for better or worse. The next few years of Ethiopia's domestic and international actions will be watched closely by both the West and the East as their ramifications could bring many blessings or great disaster for decades to follow.

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Cybersecurity and Cryptography: The Interrelation

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Abstract

Cybersecurity and Cryptography are essential in today's world as organizations advance the collection, processing, and storing of unprecedented amounts of data on computers and digital operating devices[8]. Large volumes of sensitive information such as personal information, financial data, intellectual property or other unauthorized data comprises today's normal business functions. This sensitive information, if compromised, could have huge negative financial, security, business, production, and market share consequences thus justifying the need for advanced technologies defined by cybersecurity and cryptography initiatives.

Introduction

Cybersecurity defines the body of technologies, processes, and practices designed to protect networks, devices, and programs [8] from unauthorized access, attacks, or damage. Cryptography is a division of cybersecurity that stores and transmits information in a particular form only accessible by intended users [9]. As computers advance and continue to integrate every facet of our economy, the need for cyber security becomes more important as cyber crimes become more and more sophisticated. Developing cyber laws and secure networks with superior cryptography for computer networks to communicate may mean a safer secure cyber world, but also encroachment on the privacy of users. Cybersecurity protects companies and individuals from being hacked and losing important information. Thus cybersecurity is the state of being protected against criminal activities, unauthorized use of electronic data, or measures used to interrupt the flow or storage of critical data. Cryptography is an essential piece in cybersecurity technology, [9] defining the method of protecting critical information through the use of codes so that the information is only readable or accessible by intended users.

This paper aims to explore the progression of cybersecurity and cryptography of cyber in the private and public domain, accompanied by a historical exploration of computer security. For further understanding, a subsection on cybersecurity and cybercrime is included to provide a deeper understanding of why cyber is necessary. In addition, several sections have been structured to address current problems and solutions surrounding cybersecurity and cryptography with subsections that delve deeper into the impacts cybercrimes have on governmental agencies, civilians, financial institutions, and businesses. This paper concludes with a futuristic view of

cybersecurity and cryptography and measures security analyst use to protect critical information.

History of Cyber Security and Computers

Since the arrival of the first computer-to-computer link, ARPANET in 1969, innovators have found a way to transmit information over computers [10] with the information ranging from messages as simple as Hello to something as technical as highly encrypted government documents. Cyber Security began with a computer research project by Bob Thomas in 1971. Bob Thomas created a computer program named Creeper. The program could travel across computer networks and leave the message "I'M THE CREEPER: CATCH ME IF YOU CAN". Ray Tomlinson, the creator of email, soon took the idea and created the first self-replicating computer worm in 1972 [13]. He also wrote one of the first antivirus software to chase the worm and delete it. As William Gibson said, "The future is already here. Its just not very evenly distributed." Cyber problems have always been prevalent but have since developed to much more concerning problems. The computer was originally built in the 1950s to do simple tasks such as computing taxes. The computer began using networks in the early 1960s with the arrival of microscopic semiconductors when billions of people were given information processing power. With the help of the semiconductors, network connections have linked billions of people to each other. The linking of billions of people has come with immense vulnerability. During this expansion era, cyber networking quickly went from academic research to a form of criminal activity and espionage.

Cyber Crime

Cybercrime is defined as a crime in which a computer is the object of the crime (hacking, phishing, spamming), or is used as a tool to commit an offense (child pornography, hate crimes)[12]. As computers advanced, so did cybercrimes. Criminals began using computers to gain access to personal information, bank information, personal computers, and even to commit acts of

cyber-terrorism. Criminals who committed those crimes were referred to as hackers. Cybercrime can usually be broken down into two categories: 1) : Crimes that prey on computer networks and/or devices. 2) : Crimes that involve using a computer network to facilitate other crimes. Cyberstalking, identity theft, phishing, and fraud are all examples of this.

Hacking

Hacking is defined as the gaining of unauthorized access to data in a system or computer[15]. The FBI reports that more than 4,000 ransomware attacks occur daily, while other research sources state that 230,000 new malware samples are produced every day [17]. Most recently, Target was hacked and 70 million people had their personal information stolen. Hacking has become such a problem that some believe a cyberwar is on the horizon. Cyberwar is the use of computer technology to disrupt the activities of a state or organization, especially the deliberate attacking of information systems for strategic or military purposes [16]. Cyberwar is fast approaching and presents a dangerous world we have yet to explore. A Hacker's goal is to access information that is not meant for them. Hackers also put bugs into network systems to gain even more access to unintended information. As a result of hacking, cybersecurity has become a critical business function in government and corporate cyber entities. As the security of cyber begins to increase, encryption becomes more complex and overly sophisticated.

Cyber Security

A majority of information is maintained and stored in a digital form in our present environments; some critical and some non-critical. Nevertheless, the importance of the security of that information is atop any other security measure. Trillions of dollars are spent on algorithms, software, and personnel to protect information. Daily, hackers are finding loopholes in cybersecurity technologies, thereby finding new ways to attack governments, corporations, individuals, and other important entities.

Government

The National Security Agency (NSA) was created in 1952 in order to protect the US government from possible security breaches [6]. As a result of an attempted breach by a German hacker, the NSA has put a fair amount of emphasis on cybersecurity. The German hacker, Marcus Hess, hacked an internet gateway in Berkeley and used the connection to piggyback on ARPANET [10]. He then hacked 400 military computers and Pentagon mainframes with the intent to sell the information to the KGB. The government began to take notice of how important and powerful these computers and computer networks were when the secret information became compromised. Countries such as China, Russia, Israel, and the United Kingdom are always building upon their cyber warfare capabilities. They realized the capabilities and intrusions that could be accomplished via a computer. To this day, our government is constantly under attack in cyberspace from other countries and adversaries.

Companies

Companies belonging to many different industries are attacked by hackers every day. According to Cybint Cyber Solutions facts, 64% of companies have experienced web-based attacks. A PwC study last year revealed that nearly 62% of global CEOs worry cyber threats will affect their company's growth prospects. As a result, it is not surprising that potential cybersecurity risks "will pressure CIOs at [Forbes Global 2000] companies to increase IoT security spending by up to 25% of the budget, temporarily neutralizing business productivity gains." Companies are tasked with making sure their operations are not compromised, as well as their customer's personal information.

General Population

Nearly 9 in 10 Americans today are online or using companies that use online databases to keep their customer's personal information. Because so many customers' personal information are attached to the internet one way or another,

roughly half of the adults living in the USA have had their data exposed by hackers[18].

Current Problems

Cybersecurity is constantly adapting to new cyber threats. Malware, phishing, machine learning, cryptocurrency, and more have become more sophisticated and harder to defeat. As our dependency on technology increases, organizations are no longer asking if they will be attacked, but rather are asking how they will be attacked by cyber threats. Below are some current cyber threats that are having a huge impact on the expansion/development of cybersecurity.

Machine-to-Machine Malware Attacks

Billions of devices that are used in businesses and households are being connected to network systems every year. Televisions, printers, computers, tablets, and even refrigerators are connected to some form of network system. Because these devices are connected and often overlooked, hackers are given easy access to embed malware. The malware can be planted through vulnerabilities found within the devices. For example, multiple vulnerabilities were found in Google Nest cameras giving attackers full control of the camera. One of the biggest vulnerabilities was that an attacker could use multiple weave packets and brute force a pairing code and interrupt connection between Nest camera and controlling device such as a phone.

Sham Technical Support And Phishing Attacks

Phishing is the fraudulent attempt to obtain sensitive information such as usernames, passwords, and credit card details by disguising as an entity in an electronic communication [14]. Phishing is commonly implemented through an email that poses as a business trying to "verify" a customer's personal information. The clever cybercrime has been around since AOL was released in 1985. However, phishing attacks have

become more sophisticated. What is new about phishing attacks? The hackers are now using pop up alerts containing viruses that can not be detected by antivirus products in an attempt to get web users to unknowingly download malware to their devices.

Cryptomining: Better way of Ransomware

In 2017, ransomware was the most talked about malware. It used hostile programs to encrypt user files and demand payment in bitcoin to reclaim the files. However, ransomware use rates have plunged and crypto mining has emerged. Crypto mining is a computational process using complex computer hardware that deals with a series of mathematical equations. The main goal is to verify all the transactions that are present in the digital ledger; this is rewarded with more crypto-coins. Inconspicuously, hackers have now just infected user computers with crypto mining software instead of demanding cryptocurrency from attack victims.

Current Solutions

As of 2019, The United States only has three main federal cybersecurity regulations: 1996 Health Insurance Portability and Accountability Act (HIPAA), 1999 Gramm-Leach-Bliley Act, and 2002 Homeland Security Act, which included the Federal Information Security Management Act (FISMA)[11]. Below are a list of federal government attempts to strengthen cybersecurity laws:

1) Cybersecurity Information Sharing Act (CISA): Its objective is to improve cybersecurity in the United States through enhanced sharing of information about cybersecurity threats, and for other purposes. The law allows the sharing of Internet traffic information between the U.S. government and technology and manufacturing companies. The bill was introduced in the U.S. Senate on July 10, 2014, and passed in the Senate October 27, 2015

2) Cybersecurity Enhancement Act of 2014: It was signed into law December 18, 2014. It provides an ongoing, voluntary public-



A Day in Havana by Anna Britton

private partnership to improve cybersecurity and strengthen cybersecurity research and development, workforce development and education and public awareness and preparedness.

3) Federal Exchange Data Breach Notification Act of 2015: This bill requires a health insurance exchange to notify each individual whose personal information is known to have been acquired or accessed as a result of a breach of security of any system maintained by the exchange as soon as possible but not later than 60 days after discovery of the breach.

4) National Cybersecurity Protection Advancement Act of 2015: This law amends the Homeland Security Act of 2002 to allow the Department of Homeland Security's (DHS's) national cyber security and communications integration center (NCCIC) to include tribal governments, information sharing, and analysis centers, and private entities among its non-federal representatives.

States

With the lack of government cyber regulations and cybersecurity personnel, the responsibility of cybersecurity is put on the states to regulate their companies and organizations to protect their customers' personal information. State governments have started to take steps to improve cybersecurity by requiring firm transparency regarding user's data. For example, California passed the Notice of Security Breach Act in 2003 which requires that any company that maintains the personal information of California citizens and has a security breach, must disclose the details of the event. The security breach regulation punishes firms for their cyber security failures while giving them the freedom to choose how to secure their systems. The regulation has worked well and has propelled other states to implement similar cybersecurity breach regulations.

The Future of Cybersecurity and Cryptography

As organizations continue to invest in the Internet of Things (IoT) and cognitive computing, cyber threats will inevitably continue to grow in both complexity and volume. Therefore, the race is on to secure these devices and their information from exploiters. Concurrently, the ubiquity of mobile devices have added to the volumes of structured and unstructured data and the complexity of protecting it. Security professionals are challenged daily to develop software and sensors to sound the alarm on unusual activity and improper use. In the cyber world, "criminal activity always leaves a digital trail" [11], which analysts can use to identify this data to identify malicious attackers and predict attacks before they occur. This preemptive measure is termed cognitive security, whereby security analysts look for human patterns, behaviors, and thought processes to detect threats against physical and digital systems. Additionally, security analysts use cognitive computing or machine learning in order to process data can be processed rapidly, and accurately to predict criminal activity. With the vastness and complexity of data transmission,

receiving, and storage devices, cognitive security and cognitive computing will greatly impact the future of cybersecurity. The more tools security analyst have, the faster they can predict, detect, and identify malicious attackers.

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The Importance of Military Discipline in the 17th Century Manchu Army as Seen in Dzengseo's "Diary of my Service in the Army"

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Abstract

This essay explores the importance of military discipline in the Manchu army in the 17th century through the primary source document of Dzengseo's "Diary of my Service in the Army." This essay argues that leaders of the Manchu army largely enforced discipline for practical, not moral, reasons. These practical reasons include facilitating the Manchu army's appropriation of civilians' crops and livestock, preserving the rank structure with regards to allocating the spoils of war, and encouraging the enemy to surrender as opposed to fighting to the death.

The good order and discipline of an army has massive impacts on the unit's combat effectiveness. Furthermore, it has drastic effects on the civilian population, existing infrastructure, and the natural resources of the surrounding area. The leaders of the Manchu army understood how important discipline was and worked tirelessly to maintain it. Before they began their conquest of China, this army had a comprehensive set of rules and regulations that they would use to dictate the conduct of their troops. The Manchu army relied on the general's guard, comparable to a military policeman, to enforce these laws of war. These rules and regulations prohibited killing any soldier who was surrendering, stealing any sort of property from prisoners of war, indiscriminate raping of women, and stealing and butchering large animals belonging to civilians such as cows, sheep, and goats. The ideological backing for a great majority of these rules did not lie in a theoretical set of moral values; instead, the leaders of the Manchu army created and instituted these rules for practical matters.

Dzengseo's "Diary of my Service in the Army" illustrates why the leaders of the Manchu army placed such a strong emphasis on the good order and discipline of their unit; the practical reasons for enforcing discipline amongst Manchu troops include facilitating the army's appropriation of civilians' crops and livestock, preserving the rank structure with regard to allocating the spoils of war, and encouraging the enemy to surrender as opposed to fighting to the death.

One of the main reasons for enforcing discipline was to allow the Manchu army to seize civilians' crops and livestock in an organized manner to ensure that all soldiers receive their share of food. The logistical supply chain of armies during the 17th century was nowhere near as sophisticated as it is today. Thus, armies had to rely on the resources they

could find to keep their soldiers fed. If the Manchu army needed to utilize a civilian's animal or crops, they would seize and distribute it throughout the chain of command. Not only would this guarantee that all soldiers would receive the necessary rations to sustain the campaign, it would prevent soldiers from having to act unilaterally to find their next meal. If every single soldier was responsible for finding food to eat, the army would quickly descend into chaos with each man acting as an individual as opposed to a member of a larger organization with a common goal. Every level of leadership was directly responsible for ensuring that their troops adhered to these rules and regulations. If a soldier under an officer's command violated any of these guidelines, they and their officers would also receive a punishment. Dzungseo gives an example of this in his entry from April 29th, 1680. In this specific entry, he describes how the servants of a soldier butchered a cow and proceeded to consume it. As the rules and regulations of the Manchu army prohibited the unauthorized butchering of a cow, this sort of behavior warranted punishment. Unfortunately for the servants, the soldier, and his leadership, members of the general guard caught the servants in the act. Dzungseo goes on to explain the punishment each level of leadership received. He writes:

"The general summoned me and the camp commanders, and made us sit in [his] tent. He comforted us with good words, but we felt ashamed. After the crime was adjudicated, Ganduhai was sentenced [to a fine of] three months of salary, I and the assistant adjutant Dandai to a fine of six months of salary, the corporal to seventy cane strokes, the slave master Hoošan to eighty, and the servants to a 100" (Dzungseo 48).

This passage shows just how seriously the leaders of the Manchu army took the conduct of their troops. The general may have comforted his subordinates in their meeting, but he did not show mercy when dealing out his punishment.

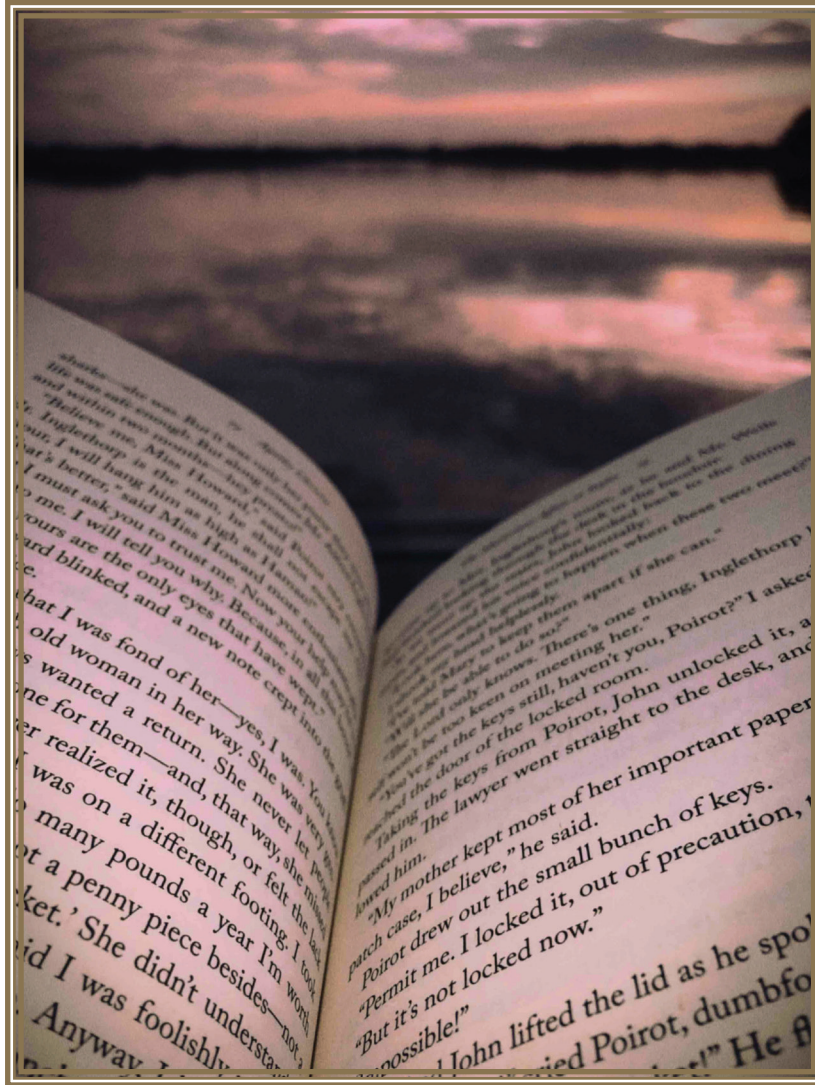
As previously stated, the leadership of the Manchu army enforced their strict rules and regulations mainly for practical reasons. They were not based in a moral code as much as in the basic necessities of survival and functionality. A traveling Manchu army simply did not have the logistical support to adequately feed every man. Historians Christine Moll-Murata and Ulrich Theobald estimated that the number of Manchu soldiers during that time was in the tens of thousands. In their chapter, "Military employment in Qing dynasty China" they write, "A competing estimate that assumes the higher figures of companies given in the Qing statutes, 320 Manchu...in 1644...which can be broken down into 96,000 Manchu...troops" (Moll-Murata and Theobald 354.) To ensure every man received food while still maintaining a sense of command and control, the Manchu army had to seize the crops and livestock in an organized manner. Thus, the general could not tolerate any sort of unauthorized seizing of a civilian's property.

The passage above also demonstrates the collective nature of the general's punishment. Although Dzungseo is serving as a commander at a regimental level, he receives quite a severe punishment for the actions of his servants. In fact, Dzungseo is not even the highest level of leadership to receive a punishment. Even though the general relied on his personal guards to enforce the rules, he held every leader, including the most junior officer and enlisted leaders, directly responsible for the conduct of his troops. This command philosophy worked to instill a sense of collective responsibility for the actions of all soldiers and encouraged lower-level leadership to take a keen interest in the conduct of their soldiers.

Dzungseo describes multiple instances where the Manchu leaders issued official orders to loot villages. On an entry dated May 2nd, 1680, he writes, "On the fourth, after the food supplies for the whole army had been used up, the general gave the order to move camp, to set up a new camp at a distance of 15 li from Binzhou, to search for food in every single village, and to pound the husked rice" (Dzungseo 48). This passage shows how the Manchu army had to rely regularly on

civilians' crops to feed their soldiers. Furthermore, it gives additional context to the April 29th entry.

Although the punishment from the April 29th entry may seem severe, the general knew that his camp was running low on supplies. This subsequently meant that his army would have to resort to looting in the very near future. Thus, not only did the soldier's servants steal and butcher a cow that belonged to a civilian, they stole and butchered a cow that could have been used by the Manchu army to feed several men. Although these rules may seem unnecessary, historians Mark C. Elliott and Ning Chia attribute the Manchu army's success directly to their ability to behave in a disciplined manner. They explain, "The success of the Qing conquest of China is, in large measure, explained by the effectiveness of Qing military forces, who were molded by the strict discipline and warrior ethic imposed by the Eight Banner system" (Elliott and Chia 68). As these two diary entries demonstrate, the general officers of the Manchu army placed a strong emphasis on discipline to facilitate the seizing and distribution of crops and livestock.



A Sundown Caper by Jacob McKewn Williams

Similar to the facilitation of seizing and distributing crops and livestock, the leaders of the Manchu army also enforced discipline to preserve the rank structure with regard to allocating spoil. After a unit of rebel soldiers surrendered, the Manchu army would begin dividing up their possessions and distributing them amongst the ranks. The highest-ranking officers would receive the most while the lowest-ranking enlisted men would receive the least. Thus, it was illegal to steal any possessions in an independent manner. Although this rule may seem simple enough, it required a high level of discipline from Manchu soldiers. In Pamela

Kyle Crossley's *The Manchus*, Crossley explains that "Looting was forbidden, which

required a much greater degree of discipline and professionalism among the troops" (Crossley 72). Nevertheless, Manchu leaders had to enforce this regulation for two major practical reasons. First, it would ensure that high-ranking officers would receive their due share of the spoils of war. Additionally, it would prevent a captured city from falling into chaos with every soldier of every rank attempting to steal as many material goods as

“On the second day of the eleventh month, in order to take care of the women, pearls, jewels, and other possessions from the palace of Wu Shifan, and of the wives, children, and valuables of the rebel generals, Lieutenant-generals Mujan and Maci...and others made an inventory, and ordered the officers of the Guards regiment to guard all the residencies” (72).

It is also important to note that the amount of loot that the Manchu army leaders would allocate to their troops was not insignificant. Dzungseo's diary provides great insight into just how much plunder a soldier could receive. Part of Dzungseo's entry dating March 14th, 1681 reads, "I prepared my baggage, loaded it on more than thirty horses,

and happily departed from Yunnan together with the Beise” (Dzengseo 75). Dzengseo was a regimental-level officer. Although he was not a lowly enlisted man, he was not a general officer. It

is fair to say that he was sitting in the middle-tier of the military hierarchy.

Thus, it is astounding that he needed thirty horses to transport his fair share of the plunder, a truly considerable amount of wealth to accumulate from war. These entries show why military discipline was so important with regard to seizing and distributing the spoils of war. The Manchu army had a very sophisticated and organized process for allocating the rebels' goods throughout the chain of command. If followed, many officers and enlisted would receive a significant amount of material possessions. If this was not followed, the city would descend into chaos with every soldier pillaging as an individual. Reckless soldiers would likely destroy

In entries dating December 20th, 1681 and December 29th, 1681, Dzengeo describes how the leadership of the army began to distribute women, silk, and other spoils to the officers and enlisted men under their command. These passages demonstrate just how sophisticated the Manchu were in seizing and distributing the spoils of war. They had a standard operating procedure that guaranteed all soldiers would receive an amount of loot in accordance

The task of preventing authorized looting became significantly more difficult during the periods immediately following the fall of a city. After an enemy force surrendered a city, the Manchu army had to work diligently to ensure the city did not fall into a state of indiscriminate pillaging. Dzungseo describes one such instance in his entry dated December 8th, 1681. After



countless valuables in the chaos and many soldiers would attempt to take more than their fair share. Leaders of the Manchu army understood this and enacted official proclamations warning soldiers not to engage in unauthorized looting. In an entry dated February 13th, 1681, Dzungseo included one of these proclamations. It read, "I shall send out people [on patrol], they will arrest those who plunder and steal, will deal with those arrested in accordance with the law, will impose heavy punishments on the officers in charge" (Dzungseo 73).

It is important to note that the Field Marshall was not just threatening the soldiers engaging in looting; he was also threatening their officers. By doing this, all levels of officers would be very invested in preventing their soldiers from acting in a disobedient manner. This culture of discipline eventually evolved into one of the most impressive characteristics of the Manchu army. Decades later, Qianlong, the sixth emperor of the Qing dynasty, would showcase this aspect of his military to Central Eurasian tributary representatives. In *China Marches West: The Qing Conquest of Central Eurasia*, Peter Perdue writes, "Qianlong brought Central Eurasian tributary representatives with him to Jiangnan...He constantly invoked the theme of military discipline while on tour" (Perdue 424). That same discipline won his predecessors control over the empire, perhaps the ultimate spoil of their conquest.

The Manchu army leadership also relied on the discipline of their soldiers to encourage the enemy to surrender to prevent unnecessary casualties. One of the rules of the Manchu army's code outlawed killing an enemy soldier who was requesting quarter. Although this is essentially the only right the Manchu army afforded to enemy soldiers, it is an extremely important one. As Nicola Di Cosmo writes in his introduction to the diary, "Even though the fate of the prisoners, both men and women, was grim, there were still some rights that were recognized to them. When respected, these rights, as limited as they were, preserved the lives of men and women who surrendered" (Di Cosmo 35). Like many of the other Manchu army rules, it served much more of a practical purpose than a moral one. If the enemy knew retreat was not possible and

that the Manchu army gave no quarter, they would fanatically fight to the death while inflicting as many casualties as possible. To prevent these unnecessary casualties, the Manchu army forbade soldiers to kill a surrendering enemy. If a unit or even a single soldier was undisciplined, it is easy to see why they would kill an adversary attempting to surrender. Just moments before, both combatants were attempting to kill one another; a soldier may have even seen an enemy kill one of his friends. It takes a significant amount of restraint to resist both instinct and emotions to show quarter to one's enemies.

Although the Manchu army was usually quite disciplined, there were several instances of soldiers disregarding this law. Dzungseo writes about one such event in an entry dated July 21st, 1680. Dzungseo describes how Manchu forces had defeated rebel forces in a recent engagement. Not only did the Manchu forces rely on infantry and cavalry units during this specific battle, they also utilized artillery pieces to put the rebels in a combined arms dilemma. Realizing they had no option but to capitulate, the two rebel generals surrendered their units to the Manchu forces. Dzungseo writes:

"Though the false generals Huang Ming and Ye Bingzhong had surrendered, they had been killed together with another forty officers, and their household properties, women, and children had been confiscated and divided up among our councilors and camp commanders. I heard this and thought that this was not the way to keep order" (54).

Even Dzungseo, who is not an extremely high-ranking officer, understands the strategic and tactical implications of executing surrendering generals and officers en masse. If this sort of behavior became a habit, rebel generals would simply have their units fight to the death instead of surrendering since both actions had the same consequence. Subsequently, this would result in countless unnecessary Manchu casualties, ultimately degrading their ability to successfully wage war. This is why showing discipline and restraint was

important. Something as small as offering no quarter can have campaign-altering strategic implications.

Dzengseo gives another example of this in a later entry. After successfully defeating a rebel army, Dzengseo pursued a group of fleeing enemy soldiers. As soon as he reached them, he demanded that they surrender. They agreed and laid down their weapons. Dzengseo, understanding the importance of discipline and restraint, was prepared to take these rebels as prisoners of war. Unfortunately, a bayara guard, who should have been one of the most disciplined soldiers, shot one of the rebels with an arrow. Realizing that the bayara guard would not show them quarter, the rebels realized that there was no reason to surrender. Several of the rebels fled while two rebels attacked the Manchu soldiers. Dzengseo describes the subsequent events:

“Two rebels got hold of long swords that had been abandoned, and, indifferent to death, came forward slashing [at us] ... I saw that armored soldier Dengse could not climb onto the bank. One rebel caught up with him and hacked at him. Because Dengse was scared, he ducked, turning his body on one side, so the rebel hit the quiver and the horse’s croup. As Dengse fell off the horse, I shot the rebel, and made him fall down. Who killed the other rebel, I do not know” (66).

This passage proves just how desperately and fanatically enemies would fight if they knew that seeking quarter was futile. Dzengseo is sure to note that the rebel soldiers were “indifferent to death,” and it is not difficult to understand why this is the case (66). These rebels accepted their fate and decided to go out fighting as opposed to begging for mercy.

Furthermore, this passage also shows how dangerous this can be for the Manchu army. One of the rebels nearly managed to kill a Manchu soldier. If it had not been for Dengse’s dodging maneuver and Dzengseo’s accuracy, the Manchu army would have unnecessarily lost a soldier all due to a simple lapse of discipline. This entire ordeal could have been avoided if the bayara guard had

shown more restraint. These two diary passages demonstrate how the Manchu army relied on the discipline of their soldiers to show restraint and subsequently encouraged rebel soldiers to surrender instead of fanatically fighting to the death.

Dzengseo’s diary is a significant historical document for several reasons. It gives the reader an extremely insightful look into what a regimental-level officer in the Manchu army during the 1680s was concerned about. It even details how far troops would move in a day, the equipment soldiers used, and the thought process behind many decisions. Moreover, it gives several detailed first-hand accounts of combat. Although these are all quite enlightening, one of the most important aspects of this diary is Dzengseo’s emphasis on military discipline in the Manchu army. Studying this allows the reader to begin to understand certain dynamics at play within this elite fighting force. It sheds light on why the leaders created and enforced a comprehensive code of conduct, why punishments were so severe, why the rank structure was extremely hierarchical, and why this army placed an emphasis on customs and courtesies. By examining the importance of discipline in this diary, the reader is better able to comprehend the culture of the Manchu army.

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Geopolitical Impacts of Wahhabism in the Middle East

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Abstract

This essay discusses the geopolitical impacts that the spread of Wahhabism has had on Saudi Arabia domestically and regionally. It examines the origin of Wahhabism, its modern-day implications, and how it has fostered an environment for extremism in the Middle East.

Although Wahhabism is largely based in Saudi Arabia, its spread has had broader implications on the entire Middle Eastern region. There have been numerous negative geopolitical impacts on the region surrounding Saudi Arabia as a result of Wahhabi-motivated conflicts. Wahhabism is an ultra-conservative form of Islam which has been adopted by Saudi Arabia as their state religion. Wahhabis believe that other Muslims who do not follow the strict interpretation of the Qur'an, which is central to Wahhabism, are morally unjust and inferior. This thinking process results in ideological and religious clashes which enhance tensions throughout neighboring countries of Saudi Arabia. This strict adherence to Wahhabi beliefs has also negatively impacted Saudi Arabia's push towards political, economic and social reform. Saudi Arabia still has one of the highest rates of gender inequality and has a workforce largely devoid of women which has greatly impacted their economy. It is crucial to examine how Wahhabism has contributed to violence, proxy wars, stagnated reform, and increased geopolitical tension on a domestic and interstate level throughout and around the Arabian Peninsula. Saudi Arabia's continued goal to spread Wahhabism also has international implications because they continue to outsource their ideas by building mosques and working with international organizations.

The practice of Wahhabism originated in Saudi Arabia during the 18th century. Wahhabism was named after its founder, 18th century theologian, Muhammad ibn Abd al Wahhab, who was born in 1703. He wanted to bring Muslims back to the "basics of Islam" because he felt that they had strayed from its pure teachings.¹ Muhammad ibn Al Wahhab then decided to write a book that emphasized any misplaced reverence was a direct assault against God. His theological viewpoints were viewed as strict and declared Wahhabism as the only true faith. This meant that Wahhabis could denounce other Muslims as non-believers. Over the centuries,

many of his teachings have been changed to recruit more followers. In the 1960s, Wahhabism was able to spread with the help of Saudi petrodollars. Saudi Arabia's continued economic growth due to oil revenue has allowed them to continue to outsource their Wahhabi ideology. They do so in a multitude of ways including building mosques, relying on international organizations, and sending Wahhabi priests to other countries.² A more controversial way that Saudi Arabia has spread Wahhabi beliefs includes donations made to international schools, usually in the form of educational materials on the teachings of Wahhabism.

On a domestic level, Wahhabism has contributed to a stagnation of social and political reform. Recently, the Crown Prince has attempted to modernize Saudi Arabia. He has helped to finally legalize women being able to drive and is allowing for movie theaters to be built throughout Saudi Arabia. However, the Crown Prince's appetite for reform could infuriate the Wahhabi clerics who are protected under the State. David Ottway, a Middle East specialist, remarks on this aspect: "Crown Prince Mohammed bin Salman, is pushing his country at breakneck speed into major social reforms, rousing concern about a backlash from the kingdom's ultra-conservative Wahhabi religious establishment."³ The Wahhabi clerics have a powerful foothold within Saudi Arabia, so creating reforms that go against their strict religious establishment could result in civil unrest. Ottway then explains that "this 'normalization' of society had been stymied for decades by the royal family's cuddling of its Wahhabi clerics in reaction to the Islamic Revolution in Iran, the Soviet invasion of Afghanistan and the takeover of the Mecca Grand Mosque by Islamic extremists that all occurred in one year, 1979."⁴ To try to counteract this, the Crown Prince has tried to put the clerics under state control in a variety of ways.

Another domestic issue that Saudi Arabia faces is terrorism. By accepting money and support from the U.S. and the Trump Administration, they have promised to put it towards combating terrorism and re-building their economy. However, some critics argue that Saudi Arabia might not be using all of the money for this intention, but rather

to further spread their beliefs and fund their own proxy wars. In her article "Saudi Arabia's Uncertain Future," Karen Foerstel explains that "Saudi Arabia's critics question the kingdom's true commitment to fighting terrorism, since it adheres to—and spends millions of dollars spreading—Wahhabism, an ultraconservative form of Sunnism."⁵ Trump has given Saudi Arabia the resources and money to "fight terrorism" and "develop their economy" which they are not using for intended purposes, but instead to further their ulterior motives. These motives include religious tensions with Shiite-dominated regions like Iran. They invest money into curtailing Iran's influence, rather than on terrorism itself, which presents a huge problem with national security and prosperity. This is especially concerning because Saudi Arabia is one of the more powerful countries in the Middle East. This means they are the most capable of combating terrorism and giving the whole region a chance at returning to a state of stabilization. One expert argues that Saudi Arabia has the most impressive counterterrorist resources in the region and that they "may be the only regional power capable of bringing the IS down."⁶ However, since Saudi Arabia spends a large portion of their economy on religious efforts, this in turn effects the security of all the countries surrounding Saudi Arabia.

Since oil prices have decreased, Saudi Arabia's incessant spending towards the spread of Wahhabism is negatively affecting their economy. Saudi Arabia is focusing on spending money for religious terms rather than putting it back into their own economy to help them achieve their reform goals listed in Vision 2030.⁷ Due to this, Saudi Arabia is failing to invest money into industries other than the oil industry. Without proper investment in other industries such as tourism or infrastructure, Saudi Arabia's economy could potentially start to shrink in the next few decades.

On an interstate level, the spread of Wahhabism has heavily affected the countries of Yemen, Lebanon, Syria, Qatar and Iran. Over the past few decades, Wahhabism has catalyzed religious tensions between the Sunni and Shia. It has caused

civil unrest in many border regions surrounding Saudi Arabia and has contributed to the humanitarian crisis in Yemen. Due to the fact that Wahhabis disdain other Islamists, they have often resorted to violence as a means to spread their influence.

Yemen specifically has felt long-term negative effects from the spread of Wahhabism. Historically, Saudi Arabia has often had conflict with Yemen, a country situated along their southern border. Their goal since the mid-twentieth century has been to stifle Yemen's influence in the region. According to a historical text King 'Abd al- 'Aziz of Saudi Arabia said "Keep Yemen weak,' to his sons on his deathbed in 1953."⁸ Saudi Arabia's goal in controlling Yemen has been to quell any religious uprisings at their southern border. They have intentionally "supported Yemeni actors opposed to the unification of Yemen and fought against foreign invaders by proxy war."⁹ Through this methodology they are able to suppress Yemen and further destabilize the country so that it cannot become powerful. Beyond just proxy wars, Saudi Arabia has led a military intervention into

Yemen in the war against the Houthis. They have conducted numerous airstrikes in Yemen, further worsening the current humanitarian crisis that is ongoing there. Although Saudi Arabia has sought to weaken Yemen, they do not want Yemen to become a failed state because that could cause security implications. Saudi Arabian policy expert Stig Stensile remarks on this "Although the Saudis are obviously concerned about state collapse in Yemen, they are also worried that their influence in the neighboring country may be in decline as a result of two parallel developments."¹⁰ If Yemen continues to fragment, Saudi Arabia worries that their biggest religious rival, Iran, will be able to gain influence there. This would counteract their decades of effort to spread and maintain the Wahhabi faith in Yemen.

In the Middle East, Saudi Arabia and Iran are two of the biggest rivals. Wahhabism has been a

large factor in fueling the tensions between the two countries. Joseph Cozza and Giorgio Cafiero have examined Saudi-Iran relations and have found that "according to conventional wisdom in Iran, Saudi Wahhabism is the ideological force responsible for ISIS."¹¹ This source of contention, whether true or not, has fueled hatred among the countries and a swath of religious proxy wars in the region. Even the Iranian foreign minister publicly commented on the effects of Wahhabism, saying that "Wahhabism has been devastating in its impact. Virtually every terrorist group abusing the name of Islam – from Al Qaeda and its offshoots in Syria to Boko Haram in Nigeria – has been inspired by this death cult."¹² When an Iranian official comes out and denounces a religion that is strongly associated with Saudi Arabia, it starts to paint a negative picture of the entire country itself. Both countries continue to try and further their influence in the Middle East

and have used religious duty as a medium for doing so. However, from most Wahhabis' perspectives, they believe the assertions made by Iran are simply not true. Those in the Arabian

Peninsula "take offense to the argument that their sect of Sunni Islam is responsible for the outgrowth of extremism. They view IS as deviant and point out the dozens of attacks that IS- and al-Qaeda-offshoots have waged on the kingdom since the mid-2000s."¹³ From a Wahhabi point of view, they believe that Saudi Arabia has been the victim of ISIS and other extremist groups. They make it a point to state that Saudi Arabian government officials have helped or monetarily assisted the campaigns led by the U.S. to combat extremism in the Middle East. Both Iran and Saudi Arabia make valid points, however, Saudi Arabia's continued funding of Wahhabism and attempts to spread their influence have worsened the situation in the region and further infuriated Iranians and other Shia countries. Saudi Arabia has also continually supported rebels in neighboring countries who wish to overthrow Shiite government officials. A prime example of this is that "the Saudis

"The Sunni-Shia conflict between Iran and Saudi Arabia has therefore been calamitous for the development of the region."

back rebels fighting to overthrow President Bashar al Assad, who is supported by Iran.”¹⁴ The Sunni-Shia conflict between Iran and Saudi Arabia has therefore been calamitous for the development of the region. This religious conflict has further destabilized countries such as Syria, Lebanon, and Yemen, and added to the strain on their governments.

Although it is important to examine how Wahhabism has affected geopolitical relations in the Middle East, it is equally important to examine how Saudi Arabia has been able to export these beliefs. Saudi Arabia’s primary method of spreading Wahhabism has been to fund the building of mosques throughout the region. Their primary source of funding comes from the revenue generated by their oil industry, however, some of their funding comes at the favor of other countries, including the U.S. Due to this, some experts argue that “the United States should focus on political, rather than economic, reforms in the kingdom.”¹⁵ Saudi Arabia’s use of the United States’ money for religious purposes can be contentious because it could cause other Middle Eastern countries to become aggressive towards the U.S. Even worse, the United States’ staunch support of Saudi Arabia could drag it into future wars. Even if it was not intentional, it has also been proven that many Wahhabi mosques are used as recruitment centers for extremist groups like Al-Qaeda. Besides just mosque-building, Saudi Arabian Wahhabis engage in many other secondary methods to promote their faith. Some of these methods include providing textbooks for religious education, travel support for Saudi preachers, humanitarian aid support that has a religious context, and use of the Salafi media. Using this multi-faceted approach, Saudi Arabia has been able to successfully increase the spread of Wahhabism exponentially.

Overall, Wahhabism has had a significant impact on both Saudi Arabia and its interstate relations in the Middle East. Whether intentional or not, Saudi Arabia’s agenda to spread Wahhabism has provided a clear platform for extremist groups such as ISIS, Al-Qaeda, and Boko Haram. This environment created by the spread of Wahhabism has resulted in civil unrest and sometimes in military conflict. Wahhabism has contributed greatly to

stagnated reform in Saudi Arabia and allowed for the denial of basic human rights. Although Saudi Arabia pledges commitment to combat terrorism and to modernize some of their domestic policies, it is still unclear how steadfast they are about doing so. Wahhabism is a deep-rooted part of Saudi Arabian culture, and it will continue to have adverse effects on a domestic and interstate level if Saudi Arabia refuses to stop exporting it.

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Ring March by Dashawn Costley

Implications of Quantum Computing on Computational Complexity Theory

Introduction

Computational complexity theory works to divide open-ended problems into categories based on their solution's complexity. For example, the category "P"- for polynomial- refers to a problem that can be solved on almost any given classical computer, such as sorting, graphs, or GCD's. Moving up, an "NP" level problem is any decision problem which can be verified, but not solved, in polynomial time. The N stands for non-deterministic. The final main computational complexity class that exists is NP-Complete, which contains specific NP-level problems wherein every other NP-level problem is reducible to it in polynomial time. An additional, less-used class, but that will be referenced later in this report, is EXP. EXP class refers to decision problems that can be solved in exponential time.

Intractability refers to the concept that a given computational problem can only be solved theoretically with classical computing, due to constraints on either memory or time. This generally goes hand-in-hand with NP-complete problems. However, in some fringe cases, an NP-complete problem may become tractable with small numbers, or a P may become intractable with large numbers. As will be elaborated on later in this paper, quantum computing may change the definition of intractability by adding a new computational complexity class.

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Abstract

Quantum computing is a new, shallowly-explored field in computer science. Its ability to compute and store in non-binary operations revolutionizes how basic gates and mathematics operate, allowing for an entire new system of computing. This paves the way for a new understanding of computational complexity theory.

Bounded Quantum Polynomial time (BQP)

BQP refers to the alphabet of decision problems wherein problems can be solved in polynomial time using a quantum computer. It is analogous to classical computing's P [1].

A quantum computer uses logic gates made of qubits, the quantum equivalent of classical bits, which allows for superpositions deeper than just 0 or 1. Without getting too deep into the quantum theory, this essentially allows for much more complex

problems to be solved in the same amount of time as a classical logical gate (such as NOR, XOR, or AND).

Consider a simple, P-level problem of $F(0)$ XOR $F(1)$. In classical computing, this would take at least two calls to “F”. Due to the nature of superpositioning, a quantum computer would need to only call f once, as it can compute and take in all of the superpositions of F at one time [2]. Although in small, binary situations this may not seem like a world-changing difference, when it comes to NP problems, this ability to make one call to gain multiple superpositions can bring exponential time down to polynomial, or even logarithmic.

Notable Benefits of Quantum Computing

BQP presents an interesting note when it comes to calculating the lower bounds of polynomial problems. It is assumed in most cases that the lower bound of searching through an entire structure would be N , as there are N elements in any given structure. However, with quantum computing’s ability to store multiple states at once, even this could be brought down to \sqrt{N} as based on Grover’s algorithm [3].

A complete implementation of the discrete math and physics of it are a bit deeper than needs to be explained here, but the basics of many of the quantum mechanics can be simplified.

Mechanics of Grover’s Algorithm

Grover’s algorithm begins with a quantum “coin flip”. It applies the equation:

$$m = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$$

which essentially transforms a bit into a superposition of two states, appearing as a coordinate pair with both values having a

$$value = \left(\frac{1}{\sqrt{2}} \pm \frac{1}{\sqrt{2}} \right)$$

The second value is either negative or positive and represents a phase.

The Walsh-Hadamard Transformation (WHT) is one of the crucial steps of Grover’s Algorithm, and is applied by comparing these superposition values. This transformation is vital to the efficiency of quantum algorithms, as it allows multiple states, distinguished by their amplitudes, to exist at one time. This cannot be replicated in classical computing.

Finally, it is run through a 4x4 matrix consisting of 0’s and e^{\wedge} arbitrary real numbers [3].

Implementing Grover’s Algorithm

There are three main steps. First, the system is initialized with states

$$\left(\frac{1}{\sqrt{n}}, \frac{1}{\sqrt{n}}, \frac{1}{\sqrt{n}} \dots \frac{1}{\sqrt{n}} \right)$$

which guarantee an equal distribution of amplitudes/ranges. This step takes $\leq \log N$ steps.

The next step is where the $O((\sqrt{N}))$ comes in. First, the phases are either rotated 0 or 1 radians, depending on an in-depth operation known as $C(S)$. Second, an algorithm D

$$D_{ij} = \frac{2}{N} \text{ if } i \neq j \text{ \& } D_{ii} = -1 + \frac{2}{N}.$$

is applied, which implements the WHT and rotations. The necessary amount of applications of this cycle being $O((\sqrt{N}))$ was decided through rigorous testing.

Finally, you sample the resulting states. Using the same operation used to determine the radian-rotation, a unique state is calculated. Although heavily inundated by quantum physics, Grover’s algorithm shows that operations needing a minimum of linear time in classic computing can be computed using $O((\sqrt{N}))$ in quantum computing [3].

Applications of Quantum Computing on NP-Complete Problems.

To give a brief background, the Boolean Satisfiability Problem, shortened to SAT, is an NP-complete decision problem that seeks to, at its most basic, determine if there

is a set pattern of Boolean values that will consistently evaluate to true. Although 2-SAT has been solved, 3-SAT has yet to have a working algorithm in classic computing.

Fredkin Gates

A Fredkin Gate is one of many quantum-specific gates as discussed in Section II. It is a 3-input/output gate which performs an operation $\{0,1\}^3 \rightarrow \{0,1\}^3$. In all, the gate determines whether or not $X(2)$ and $X(3)$ must be exchanged. Unlike classical computing equivalents, the Fredkin Gate is bijective and thereby reversible[4].

Implementation of Quantum 3-SAT

Allowing \emptyset to be an instance of 3-SAT which holds n variables, by its nature, there is a Fredkin circuit which will compute \emptyset on [4]. Essentially, this value is able to be put into another quantum gate known as a Hadamard Gate. Through a series of discrete and tensor equations, an either null or non-null vector is created. If an external observer is able to distinguish between these two vectors, which is not yet known, as a quantum computer has not yet been created, than 3-SAT have been solved.

Impact on EXP-level Problems

As stated by the authors of [4], this solution provides ample backing that quantum computing may be able to solve EXP problems in polynomial time uniformly.

Summary and conclusion

The accepted “solving” of SAT-3 using quantum computers opens the quandary whether $NP \subseteq BQP$. Since quantum computing is such a new field with a heavy barrier to entry of confusing notation and in-depth physics knowledge, many mathematicians have not breached the surface of this area of study. Thus, the question of $NP \subseteq BQP$ cannot be fully answered. The research solving SAT-3 provides a good basis for its



Strange Times by Chase Robert Ervin

truth, but may be a fringe case as compared to the majority of NP-complete problems that exist.

Quantum gates' ability to store and process superpositions revolutionizes classical computing theories. Additionally, Grover's delve into the field of efficient quantum-search algorithms set up a basis of speed that is not only unheard of, but functionally impossible by the way classical transistors are built.

In conclusion, quantum computing is an incredibly new field, and its fascinating mathematical and computational implications will open a whole new world of computing theory starting with BQP.

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Engaged Containment: A Viable Solution to the North Korea Problem

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Abstract

Despite occupying less landmass than most American states, North Korea has remained a fixture of United States foreign policy. The U.S. has shifted between two postures to achieve its foreign policy aims toward the nation. The policy of engagement seeks diplomatic engagement with the hermit kingdom, whereas the policy of containment seeks to trigger a Soviet style collapse through isolating the nation. This work will examine the efficacy of both policies and present a fusion of these postures: "Engaged Containment" as a viable approach for the United States to accomplish its foreign policy goals toward North Korea.

The Democratic People's Republic of Korea (D.R.P.K.) stands as the last bastion of Stalinism in the wake of the collapse and dissolution of the Soviet Union (U.S.S.R). It is, therefore, Following the end of the Cold War, the D.R.P.K. was regarded by U.S. policymakers as a regional threat in East Asia. However, with the advent of the reclusive nation's nuclear weapons program, North Korea has been contemporarily promoted to a global threat to the United States.¹ America's foreign policy goals regarding North Korea can be distilled into three primary objectives: discouraging North Korean expansionism, prevention of North Korea nuclear development and proliferation and maintaining regional stability.² While historically these goals have remained constantly irrespective of which political party is currently setting the U.S. foreign policy, the approaches to achieving these aims have oscillated between a strategy of engagement (attempting to coax North Korea into good behavior diplomatically) and a strategy of containment (isolating the D.R.P.K. in hopes of triggering the state's collapse). The efficacy and pitfalls of these different approaches are demonstrated by President Clinton's policy of engagement and President Bush's policy of containment. While neither approach has achieved the goal of curtailing North Korean nuclear proliferation or altering the hostile and erratic behavior of the regime, history has, demonstrated that so long as a full-scale U.S. invasion of the Korean Peninsula remains, there is a hybrid solution. An untenable engagement backed by the credible threat of American force is the sole approach that has any track record of producing tangible results in achieving U.S. foreign policy goals in the region.³

President Clinton inherited a relatively stable situation on the Korean Peninsula. His predecessor, George H.W. Bush, had maintained the U.S.'s historical containment posture, yet notably, H.W. Bush made several overtures toward the D.R.P.K. such as the removal of U.S.

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tactical nuclear assets from the region and promising the cancellation of the upcoming “Team Spirit” joint military exercises (which the D.R.P.K. viewed as preparations for an invasion). This outreach caused North Korean leader Kim Il-Sung to respond in kind, agreeing to allow International Atomic Energy Agency (I.A.E.A.) inspectors into the country and committing to a Nuclear Non-Proliferation Treaty (N.P.T.).⁴ This cooldown in regional tensions was fortuitous for Clinton as, campaigning on a platform of foreign disentanglement, the Clinton administration was not overeager to thrust the U.S. into the region’s drama.⁵ However, the lull in regional tensions rapidly concluded with the U.S.’s announcement to go forward with the Team Spirit exercises in 1993. This led the North Koreans to announce that they intended to withdraw from the N.P.T. within 90-days. The D.R.P.K. coupled this with the assumption of a posture of military buildup on their southern border and an announcement of plans to begin nuclear weapons development at the Yongbyon Nuclear Research facility.⁶

These provocative actions by the D.R.P.K. rocketed the hermit kingdom to the top of the young Clinton administration’s foreign affairs priorities. Clinton assumed a similarly aggressive posture, planning a massive deployment of U.S. forces to the region and sending a vanguard to establish a logistical base. Despite Clinton’s desire for U.S. disengagement in the region and Bush Senior’s positive diplomatic gains with the nation, at the outset of Clinton’s tenure, it appeared that war with the D.R.P.K. was inevitable. The credible specter of a U.S. assault proved to be too much for North Korean bravado, and the nation began desperately searching for an exit route that would allow them to save face. This route came when President Carter (who had uniquely friendly relations with the state) was dispatched to ease tensions. Carter’s talks with the nation proved successful in averting war, and North Korea subsequently expressed readiness come to the negotiating table.⁷

The question that now faced Clinton was how to handle the negotiations. Despite H.W. Bush’s acknowledgment that North Korea had a “better than even chance” of already having at

least two nuclear bombs, Clinton had made a key error prior to the negotiations even starting when amidst the regional tensions he declared: “North Korea cannot be allowed to develop a nuclear bomb.”⁸ Through this statement, Clinton had inadvertently limited his options in the upcoming negotiations as he could avoid an aggressive posture without appearing weak, both to the North Koreans and his domestic political opponents. While a military strike was deemed to be unacceptably costly, Clinton’s other primary option: economic sanctions, did not appear viable either, as the D.R.P.K.’s neighbors (whose cooperation would be vital to any total embargo) envisioned a nightmare scenario in which their borders would become flooded with refugees following the state’s collapse. Additionally, given that the D.R.P.K. already had access to all the required materials to construct a nuclear bomb (and indeed may have already had several), economic sanctions were rendered more of a punitive measure as opposed to a preventive one. Faced with pressures from hawkish and isolationist political factions domestically, and with the prospect of losing face on the international stage, Clinton opted to pursue an approach of engagement.⁹

Clinton’s policy of engagement was predicated on two points. First, he regarded the D.R.P.K. as a rational state engaging in actions that only gave the appearance of irrationality. In the Clinton administration’s eyes, North Korea’s action was geared toward maintaining the security of the regime. In this conception of North Korea, the regime would be receptive to the curtailment of its nuclear program so long as any such curtailments could provide the state with assurances that its regime was secure. Accordingly, Clinton taped Assistant Secretary of State for Politico-Military Affairs Robert Gallucci for the negotiations. Something of a dove by nature, Gallucci made non-proliferation the centerpiece of his approach while simultaneously deemphasizing the U.S.’s historical demand that North Korea improve relations with its southern cousin.¹⁰ Due to the Clinton administration’s aversion to unilateral U.S. regional involvement, Gallucci’s strategy primarily sought to entreat the D.R.P.K.’s neighbors (particularly China) to

pressure the nation into compliance with the U.S.'s aims of non-proliferation. The need for Chinese help in the region generated issues of its own; any U.N. Security Council action would require Chinese assent or abstention, which without U.S. trade concessions would not be forthcoming. For Clinton, who ran on a platform of correcting the already enormous trade imbalance with China, such concessions were an impossibility. However, while China was clear on its reservations against the economic embargo, of equal concern to all the nations involved was the emergence of an erratic nuclear-armed nation in their backyard. Thus, while Sino assistance was not forthcoming, neither was Chinese obstruction.¹¹

While ultimately, Gallucci and Clinton were unable (to the I.A.E.A.'s satisfaction) to bring North Korea into full compliance with the N.P.T., their engagement approach did bear meaningful fruit. To begin with, it was successful in averting unilateral U.S. regional intervention both militarily and economically. Secondly, although resolutely refusing to reenter compliance with the N.P.T., North Korea did delay their withdrawal from the N.P.T. in exchange for continuing high-level discussions with the United States. Finally, and most substantively, North Korea and the United States released a joint statement promising a freeze on nuclear development at the Yongbyon nuclear research facility (the crown jewel of Pyongyang's nuclear research program) and a continuation of negotiations toward reentering compliance with the N.P.T.¹² These gains did not come for free; however, with the chief price of the Agreement coming in the form of a commitment from the U.S. to assist the D.R.P.K. in transitioning its weapons-grade graphitite reactors with the more civilian orientated light water reactors. Further, Clinton's critics were quick to point out that the Agreement was largely toothless as it both allowed North Korea to continue its nuclear program until the U.S. provided the reactors and, perhaps more importantly, only shutdown the development at the Yongbyon facility while leaving the rest of the D.R.P.K.'s nuclear weapons program untouched.¹³

As Thomas Cochran of National Resources Defense Council would cynically state:

"They're staying in the [nonproliferation] regime and becoming a nuclear-weapons power at the same time... Pretty neat trick."¹⁴

While failing to obtain many substantive gains, Clinton's strategy of engagement was successful in fostering North Korean engagement and constructing a united regional front against the D.R.P.K.'s nuclear program. As Clinton's second term came to an end, the situation with North Korea appeared to be on the verge of peaceful resolution, or at very least a continuation of the status quo, had the incoming administration chosen to continue the policy of engagement.¹⁵

As discussed, Clinton's engagement strategy was largely dependent upon domestic politics. Clinton's second term began with a Republican recapture of Congress, which immediately began to renege upon the Clinton brokered Agreement, with the promised light-water reactors never materializing. Upon taking office George W. Bush initially signaled he would complete the Republican led effort of dismantling the Agreement. Critical of Clinton's engagement approach, President Bush Jr. reassumed his father's policy of containment, ordering a comprehensive review of Clinton's North Korea policy framework and, in keeping with the hardline stance of containment, did not even offer negotiation with North Korea until half a year after taking office. From the outset, Bush maintained a bi-polar stance on the D.R.P.K., offering open discussion with the nation on one hand while demanding total N.P.T. compliance (seen by the North Koreans as abject surrender) on the other.¹⁶ This hardline stance only stiffened following the 9/11 terror attacks as the Reaganite "neoconservatives", longing for a return to Cold War-era U.S. foreign policy seized control of the President's agenda. Placing North Korea in his so-called "Axis of Evil" (alongside Iraq and Iran), the Bush administration even began to contemplate an invasion of the D.R.P.K.¹⁷

Accordingly, the Bush administration announced the formal withdrawal from the Clinton brokered agreement and halted all foreign aid being sent to the nation. Bush's resumption of the containment stance had the effect of undoing the concessions gained under Clinton's engagement approach. However, the administration's ability to turn its full attention to the D.R.P.K. was

significantly precluded by the ramp-up of the Iraq War. Despite North Korea ejecting all I.A.E.A. inspectors from the nation, reactivating the Yongbyon site, and openly admitting to having nuclear weapons – preoccupied with the War on Terror, the Bush administration was unable to do anything to respond to these actions outside of essentially performative (and ineffective) military asset redeployments.¹⁸ Following the impotence of these moves, the Bush administration shifted to attempting to negotiate with the D.R.P.K. These vaunted “Six-Party Talks” appeared to be in the same vein as the Clinton engagement approach; however, these produced little substance for two primary reasons. First, while the Clinton administration sought non-proliferation, the Bush administration’s driving force was nothing short of absolute nuclear disarmament. Second, between Bush placing the nation in its “Axis of Evil” and Secretary Rice’s essentially labeling the regime as “evil” the North Koreans entered the renewed negotiations with significant paranoia regarding America’s intentions in their desires to disarm the country. It was in the context of this backdrop that, predictably, the Six-Party Talks soon stalled, devolving into a tit-for-tat cycle of provocation with the U.S. engaging in economic sanctions and regional military hardening, and the D.R.P.K. escalating its nuclear development and missile testing.¹⁹ As the Bush-era ended, the situation in North Korea looked remarkably the same as it did when his father left office: with the containment approach resulting in the D.R.P.K. reassuming its stance as an international pariah –albeit a pariah now in possession of a sizable nuclear arsenal.

As with most foreign policy, the strategies of engagement and containment are different means to a common end: the curtailment of North Korean nuclear ambitions and regional aggression. To date, neither engagement nor containment has proven successful in achieving this end. While engagement has produced the most results thus far, engagement suffused with containment appears to be the most promising way forward. Given the context of Clinton and Bush’s results, this statement may not seem correct; however, as Kim points out in his work, North Korean foreign policy:

“In the second nuclear crisis, North Korea reversed its confrontational stance four times: March 2003, June 2004, June 2005 and February 2007. Ironically, all these four reversals coincided with the U.S. dispatch of F-117 stealth bombers to South Korea.”²⁰

Indeed, while Clinton’s conciliatory approach of engagement did generate goodwill on both sides, it is essential to recall that nothing substantive (outside of promises to continue talking) came out of Clinton’s vaunted Agreement and that North Korea did not even come to the table until faced with a large-scale deployment of U.S. forces. Bush’s containment strategy was a failure not because the D.R.P.K. is unresponsive to U.S. military coercion, but instead because the threat of force from a nation already engaged in two full-scale wars is not credible.

While any actual armed conflict with North Korea would be catastrophic and intolerable to the American public (a fact which the D.R.P.K. is acutely aware of), the current holding pattern wherein the U.S. has constructed a figurative wall of military assets around the country in hopes of a U.S.S.R. style collapse will not work. As a North Korean official once stated to his U.S. counterpart during negotiations:

“We watched how you dealt with the Russians... We will not let that happen to us... The D.P.R.K. is not East Germany... We are not going to collapse. You cannot strangle us.”²¹

Interestingly, it appears that President Trump, either by luck or design, has adopted this proposed fused posture of engaged containment. To date, this has resulted in a cessation of North Korea missile testing since 2017 and, significantly, has led to the North Koreans contemplate an official end to the Korean War.²² While these actions are hardly indicative of the hermit kingdom laying down its nuclear arms or democratizing, they are some of the most substantively favorable concessions the U.S. has ever been able to extract from the nation. Given current domestic discord, it remains to be seen if the United States will successfully consolidate the recent regional gains in the foreseeable future. However, what the current progress in context with history tells us is that the way forward in North Korea lies in good-faith engagement augmented

by the credible threat of American force. Or, as more eloquently stated by Theodore Roosevelt: speaking softly while carrying a big stick.

Notes

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