Carbon

Discovery of Carbon

Carbon was discovered thousands of years ago. The Chinese knew certain black rocks would burn, which were later discovered to be coal. Coal is made out of carbon, hydrogen, oxygen, nitrogen, and varying amounts of sulfur. Coal burns in a combustion reaction with oxygen, creating carbon dioxide, water and heat.

Diamonds were discovered as early as 2500 BCE. The first recorded finding of diamonds was 3000 years ago in India, where they were valued for their ability to reflect light. In those days, diamonds were used for decorative purposes, warding off evil spirits, and providing protection during battle.

In 1772, a scientist by the name of Antoine Lavoisier showed that diamonds were also a form of carbon by burning them. Another scientist, Carl Wilhelm Scheele, showed that graphite, which people thought was a form of lead, was actually a type of carbon by burning it as well. When he burned equivalent weights of diamonds and graphite they both produced the same amount of carbon dioxide. Difinitively proving they were both made of carbon, despite their different physical characteristics. In 1789, Antoine Lavoisier listed carbon in his textbook.

Chemical Properties

Carbon is the sixth most abundant element on earth. It has four valence electrons and exists in nature in three different forms: amorphous, graphite and diamond. Amorphous carbon is an ash that has been burned. Graphite is one of the softest materials on earth and diamond is one of the hardest materials on earth. Graphite and diamond are both pure carbon; what makes their appearance so different from each other is how their atoms are bonded.

Graphite is black and chalky because the atoms are bonded together in the form of sheets. The sheets of graphite are held together with Van Der Waals forces, which allows them to slide past each other. Graphite is composed of carbon atoms with sp≤ hybridized orbitals which means that each carbon is bonded to three other carbons in a planar (or flat) arrangement creating the sheets. The carbon atoms of diamond are different. In diamonds, covalent bonds hold carbon atoms together by sharing electrons in three dimensions. Carbon atoms in diamond have an sp≥ hybridized orbitals, meaning that there are four atoms bonded to each carbon in a tetrahedral arrangement. The atoms are tightly bonded in every direction, making diamond the strongest mineral. Diamond is formed by carbon atoms being compressed deep beneath the earthís crust.

Historical Conflict: Industrial Revolution

Carbon played a large role in the Industrial Revolution and the pollution produced during that time. By the late 19th century, machine powered factories became a significant part of society. It was a time when life evolved from an agricultural standard to a modern machine-based standard. With more machines being built, the factories needed more

workers. People began leaving farms and moving into towns seeking employment at the factories. Children were sent to work in the mines to dig for coal that was used to fuel the machines, causing large amounts of pollution in the cities. However, the people most affected by the pollution were the factory workers. Many of the workers lived in slums close to the factories, where they experienced overcrowding, disease, and filthy, polluted conditions. The upper class was not affected as much by the pollution because they lived in the nicer part of town, away from the factories.

The industrial production of coal was fundamental to the conflict between growth and pollution. Coal is largely made of carbon, a major pollutant, and was expelled into the air in vast quantities during the Industrial Revolution. Fuel for the machines was originally produced by burning wood, but by the 19th Century, coal replaced wood because it was easier to find and produced more energy. Burning large amounts of coal produced black smog that mixed with mist, causing pollution that covered the skies around the factories and fell in thick layers on the surfaces of the towns. Even wild life was affected by pollution, such as the peppered moth. Before the factories started, peppered moths were able to blend in with the trees to hide from predators, leaving the black moths to be eaten. However, when the pollution started, surfaces became covered in soot and the light colored moths were unable to hide from predators. The pollution added to the terrible living conditions of the workers. The towns were overcrowded, dirty, and many people suffered from disease because of the lack of plumbing and sewage systems.

There was no alternative to pollution during the Industrial Revolution. The progression of the Industrial Revolution was moving too fast to have any control over the pollution it caused. Coal was the most cost effective resource and factory owners did not care about the affect it was having on the world, as long as they were making a profit. There was also little understanding of how badly the pollution would affect the world during this time. No one knew the production of coal powered machines would have such an extensive effect on the world's future generations.

Contemporary Conflict: Blood Diamonds

The term ‘blood diamonds’ refers to the illicit trade of diamonds to provide funds for the civil wars in Liberia, Sierra Leone, Angola, the Democratic Republic of Congo, and the Ivory Coast. From 1989-2001, Liberia traded diamonds in exchange for weapons to use in wars. The conditions in the mining operations were terrible. Soldiers that watched over the mines would torture, beat, rape and kill the children and adults that worked there. Some mines were closed off from the military, which made them much safer to work in, but those were the exceptions. The majority of the mines still have very extreme working conditions. Before 2000, 4% of the world’s diamonds were blood diamonds; but when the Kimberley Process Certification Scheme was created, the number was reduced to less than 1%. The Kimberley Process Certification Scheme is an international process that ensures the diamonds traded do not fund violence. With Africa trading their diamonds illegally to other countries, 20% of people that buy diamonds have no idea that they are contributing to the problem of illicitly traded goods and helping fund civil wars.

Blood diamonds are linked to the Industrial Revolution through carbon. During the Industrial Revolution, carbon, in the form of coal, was a significant source of energy and

pollution from the 19th century to today. It contributed to health hazards for many of the factory workers and their families, especially lung diseases and cancer. In both the Industrial Revolution and blood diamonds, adults and children mined the product, endured horrible working conditions, and were often abused by the industrialists or military officers that supervised the mines.

Solution

A possible solution to stop the blood diamond issue, is to promote the Kimberly Process Certification Scheme. Currently the Kimberly Process Certification Scheme has 45 members representing 75 countries. Expanding the number of countries involved would prevent consumer companies from purchasing blood diamonds from current civil war territories. This way the diamonds cannot be sold to fund weapons or cause more wars, and the amount of weapons obtained would be limited. The profit that funds the civil wars would eventually dry up, creating a chance for peaceful government. Diamond companies should purchase their diamonds from safer sources. There are many other sources of diamonds in the world. Of all diamonds, 1% are mined in conflict areas. The other 99% are conflict-free. There are more conflict free diamond mines in Africa, Australia, Borneo, and Canada that can export to consumer companies. With more rules and a heightened public awareness there is still hope that the mining of blood diamonds will come to a complete stop.

Discovery of Phosphorus

Dirt is composed of many compounds. Two of the most significant components required for successful crops are phosphorus and nitrogen. The word 'phosphorus' comes from the Greek word meaning 'light bearer'. In 1669 a German physician, Hennig Brand, discovered white phosphorus by accident while trying to turn urine into gold. Brand evaporated a sample of urine and produced ammonium sodium hydrogen-phosphate. When heated with carbon, the ionic salt decomposed to produce white phosphorus and sodium pyrophosphate. Mysteriously, the products also glowed in the dark. Phosphorus compounds emit light in response to absorbing radiation. Electrons exist in energy levels around the nucleus. When an electron absorbs energy it jumps from an inner orbit to a higher orbit, and when the electron falls from a higher orbit to a lower orbit, it emits a photon of light unique to the energy difference of those two orbitals. The color (wavelength) of this light depends on the difference in energy between the two energy levels traversed. Phosphorus was the first non-metal element to be discovered on the periodic table.

Discovery of Nitrogen

Fixed nitrogen is a term used to describe nitrogen combined in compounds like ammonia and nitrates, which are plant-friendly compounds. Fixed nitrogen is required by every life form to grow. Unfixed nitrogen is nitrogen gas.

One of the largest stores of fixed nitrogen was discovered in Chile in the excrement of sea birds nesting along the coast. This excrement piled up over time until it was many feet thick. A booming industry started up using the excrement to supply the rest of the world with

fixed nitrogen. Most of the United States was dependant on the Chilean supply for a long time.

Nitrogen gas was discovered by a Scottish physician named Daniel Rutherford. Rutherford first started out with an empty bottle which he turned upside down in a pan of water so that there was air trapped inside. Then he placed a candle inside the bottle of air, which made the water rise a tiny bit. He wondered why this happened. The water level rose because the air that he thought 'disappeared' when the candle was burning was oxygen gas, and the other part of the air that remained was nitrogen gas.

Chemical Properties of Phosphorus

In plants phosphorus is a vital macronutrient required for energy transfer, genetic information, and phospholipids - fatty substances that make up cell membranes. It is also important for structural and metabolic functions. For example, phosphorous is an important component of chlorophyll which is a green pigment found in plants and algae. Chlorophyll is essential for photosynthesis, which allows plants to obtain energy from light. Photosynthesis is the chemical reaction between water and carbon dioxide to produce glucose and oxygen; the oxygen is released to the atmosphere and the glucose is either stored or broken down. When broken down, the carbon-carbon bonds of glucose release energy. This energy is transferred to bonds between phosphate groups in adenosine triphosphate (ATP). ATP is an energy rich molecule and the primary source for cellular functions such as growth.

A shortage of phosphorus leads to the breakdown of plant membranes and reduces energy transfer necessary for growth. Crop fertilization programs must ensure enough phosphorus to support the critical role of this element in plant metabolism.

Chemical Properties of Nitrogen

Nitrogen is not directly available for plants to use to develop, grow or reproduce. Even though nitrogen is one of the most plentiful elements in the world (the atmosphere contains 78% nitrogen gas), many plants suffer from nitrogen deficiency. Plants should contain about three to four percent nitrogen in their above-ground leaves. Plants use nitrogen in structural, genetic, and metabolic compounds necessary for survival.

Nitrogen fixation is the natural process of converting nitrogen gas into ammonia, which is readily absorbed by plants. Nitrogen forms compounds through biological activity, at high temperatures, or at moderate temperatures with the aid of catalysts. It creates ammonia with hydrogen, and nitrogen sulfide with sulfur. Biologically fixed nitrogen is essential for the creation of DNA and proteins and is accomplished by symbiotic bacteria in the soil. These organisms convert nitrogen gas to ammonia or fixed nitrogen. Ammonia is used by all living plants to grow.

Historical Conflict: Rwanda Genocide

The Rwanda genocide took place in Rwanda, Africa in 1994. It spanned from April to July, lasting 100 days. The genocide started as a dispute between two tribes living in Rwanda,

the Hutus and the Tutsis. Although both share many things, such as ethnic background, language, religion, traditions, and land, the two tribes became enemies because of their racial differences. In the early 20th century, the Tutsis treated the Hutus like slaves because of their different skin color and body shapes. The Tutsis were always viewed as racially superior, which caused the Hutus to revolt. Then, in the early 1900ís, the Hutus took over the Rwandan government. Shortly before the beginning of the killings, a Hutu man named Juvenal Habyarimana was elected as the president of Rwanda. There was a group in a refugee camp named the Rwandan Patriotic Front (RPF) that consisted of mostly Tutsis and a few moderate Hutus. The RPF shot down Habyarimana's plane on April 6, 1994, killing the President and other Rwandan government officials. Resentment was building between the Hutus and Tutsis for a long time, but now the Tutsis had crossed the line. This was the start of the Rwanda genocide. The Hutus' plan was to exterminate all of the Tutsis in Rwanda. They did not succeed completely, but about 800,000 people were killed during the genocide ñ most were Tutsis.

Conflict over arable land was one of the triggers that started the genocide. Arable land is a region of land that is excellent for agriculture and cultivation. People fought over access to arable land as a matter of survival, for power and as a means of revenge. Conflict was constant because Rwanda has very small arable regions. Arable land disputes separated family and friends and led to increasing tension before the start of the genocide. In the years prior to the genocide, there was barely enough farmland for every family. Since the population was expanding, there was not always enough arable land for crops, and there was not enough food to feed everyone. Rwanda is one of the most crowded areas in Africa and the population doubles every seventeen years, causing severe overpopulation.

The consequences of the genocide were predominantly negative. This is because there was barely one positive thing that came from it, whereas there were many negative consequences, the most obvious being the number of deaths. In addition, sexual violence towards women was a big part of the genocide. Approximately 150,000 - 200,00 women were raped. Fighting over land was not worth almost a million innocent deaths and the pain, suffering, and degradation of sexual violence on a mass scale. Unfortunately, rape was not only a factor in Rawanda. In the early 1990s, approximately 160,000 women were raped as instruments of war in various conflicts from Africa to the former Yugoslavia. Due in large part to the scale of the sexual violence in Rawanda and Yugoslavia, the UN passed Resolution 1325 in the year 2000 and Resolution 1820 in 2009. The former prevents the perpetrators of sexual war crimes from gaining amnesty and the latter recognizes sexual violence as a "constituent act of genocide." It remains unclear whether these resolutions will prevent future acts of wartime sexual violence; but at least the leaders of the world have recognized it as a problem, and this might be the first step towards preventing it in the future.

Contemporary Conflict: Darfur

Darfur is a western region in Sudan that has also suffered ethnic genocide. The current conflict in Darfur is mainly caused by the racist government of Sudan. The government is made up of Arabs, who discriminate against the Sudanese blacks. The Arabs are in northern Sudan and the blacks are in southern Sudan. The Janjaweed is a militia group that shares the government's views against the blacks. The government has been accused many times of

supporting the Janjaweed financially, which the government always denies. The Janjaweed buys its weapons with the money from the government and uses them to murder and rape the blacks in Sudan; many of whom live in Darfur.

There are many Sudanese refugees because of the horrific things the Janjaweed are doing to civilians. These refugees are dying due to malnutrition and different diseases. Resources, such as land, water, and food, are limited and hard to find during droughts. Darfur is known for having many droughts and famines, and conflicts over scarce food resources and arable land continue to this day. Less than 40% of the land in Darfur supports permanent crops or is otherwise arable.

Solution

In February 2010, the Sudanese government and the Justice and Equality Movement declared a cease fire. It was followed by a peace treaty between the Sudanese President, Omar al-Bashir and the leader of the Justice and Equality Movement, Khalil Ibrahim. To ensure the existing peace, the United Nations should provide peacekeepers to patrol Darfur. These peacekeepers could provide safety so that no violence can occur. The peacekeepers' role would be to intervene between parties and preempt violence. Peacekeepers usually monitor buffer zones between hostile forces, and UN peacekeeping forces could be used for this purpose in Darfur. Peacekeeping forces also monitor agreements about troop withdrawal, oversee the disarmament of both parties, and assist in the demobilization and reintegration of ex-combatants into society.

Peacekeepers seek out enforcement mechanisms that employ as little violence as possible. The G8, the eight countries with the highest gross domestic product, should contribute funds to maintain fertile land in Sudan. In West Darfur, El Geneina is a suitable amount of land where a local camp of internally displaced people could farm the land. This way, Sudanese Black and Arab refugees could defeat famine and malnourishment. This opportunity could also open Sudan to trade, relieve sanctions, and boost its economy.

Gold

Discovery

Gold is one of the most valuable metals on Earth. Throughout history, gold has been treasured and even worshipped as a precious metal. It takes ten tons of dirt and rock to collect one ounce of gold. If all the gold that has been extracted was put into a cube, it would only be 150 feet long. In ancient Egypt gold was considered the flesh of the gods and both the Aztecs and Egyptians decorated their city buildings, shrines, temples and their leaders with gold. Due to its coveted status, gold was used as currency. One of the first gold currencies was created in the Middle East by the Libyans. They traded blocks of pure gold for things they wanted to buy.

Chemical Properties

Gold is found in ores. An ore is a mined rock that contains desired metals or elements.

Gold is a very malleable, soft, and ductile metal. The valence electrons in gold atoms share themselves with neighboring gold atoms, creating metallic bonds. Gold is very flexible because the atoms are not in permanent places and can move past one another in the "sea" of electrons. An ounce of gold beaten with tools can cover 300 square feet. The delocalized electrons also make gold a very good conductor of heat and electricity. Gold is also very heavy, and is usually alloyed to make it stronger. Gold does not rust or tarnish with exposure to oxygen. This is because it has a high electron valence potential and requires a great deal of energy give up an electron to create an ionic bond. Silver or copper eventually become tarnished and lose their luster. Gold does not do this, it will stay as shiny and as beautiful as the first time it comes out of the ore. This may be a reason why gold is one of the most valued elements.

A common process to extract gold from ores is called heap leaching, where the gold ore is smashed, piled, and then sprayed with liquid cyanide. The gold bonds with the cyanide, is driven from the ore and then chemically separated. Another method of mining and refining gold is called the Miller Process. In the Miller Process, a stream of pure chlorine gas is blown into a crucible containing impure molten gold. During this process, the gold is purified because the other metal impurities form ionic bonds with chloride before the gold does. The metal chlorides can be removed as salts because they are insoluble with the molten metal. The gold is now pure and ready for sale.

Historical Conflict: Discovery of the Americas

Conflict between Europe and indigenous America was fundamental to the Era of Exploration. When the New World was discovered, it brought wealth and prosperity to European nations, in large part due to the exploitation of gold resources the native populations possessed. The Spaniards came to America in the late 1400's and took over the land by the 1500ís. During those years, ancient native civilizations such as the Aztecs, Mayans and Incans faced extinction from disease and advancements in the Spaniards weaponry. The Spaniards tortured, raped, killed, religiously condemned, and stole all the gold from the Indians. They felt that the Indians did not deserve to have wealth and prosperity due to their pagan sins and barbaric ways. The Spanish slit their throats and could kill five indigenous warriors at a time simply by using a horse. The Indians only had their hands, clubs, and ropes, which were ineffective protection from the Spanish. The number of Indians killed either through force or disease made the Spanish army look extremely powerful and proved their superiority against the Indians to the rest of Europe.

When gold was first discovered in the New World, Christopher Columbus led an operation to form a strong labor work force comprised of natives of Hispaniola to collect the gold. The Spanish monarchs, King Ferdinand and Queen Isabella, considered Columbus' gold search to be a failure. Spain was set on developing the land rather than just pillaging the resources from the natives who inhabited it. Even though Spain wanted it, gold was primarily an obsession of the conquistadors, whereas the monarchy was more focused on the slave trade.

As history played its course, the settlement of the New World was an important and messy chapter, but things could have been different. The Spanish conquered the New World too fast and were too aggressive towards the natives. If the Spanish tried to make peace with the indigenous peoples instead of attacking them with guns, they might have formed an alliance. For example, Columbus initially traded foods, furs, and fabrics for gold. This trend could have continued if the Spaniards kept their greed in check. The Spanish felt like it was their responsibility to "punish" the natives for believing in their pagan gods, and this made any peace difficult.

Contemporary Conflict: Democratic Republic of Congo

In the Democratic Republic of Congo (DRC), various armed militias control areas of the country, specifically in the eastern provinces. The rebel groups' terror campaigns employ fear tactics to create mass intimidation by having enforcement teams in the towns and villages. The rebel groups use the people as slaves to work in mines for no pay and under unhealthy conditions. Once the profit from the exported minerals is collected, the rebel groups are able to purchase more weapons and ammunition, thereby keeping control. The slaves are treated in a cruel manner and must work many hours without food or drink. Most of the women are raped and abused. Children are also working in the harsh conditions in violation of child labor laws. The incredible amount of poverty has caused significant proportions of the population to risk their lives by mining in dangerous conditions. This conflict is also causing environmental problems. All the mining in the DRC is contaminating the water that flows in the streams and lakes, ruining fresh water resources. The United Nations sent peacekeepers in October of 2010 to work out a peace treaty, but they were attacked by the rebel groups, causing them to return to the US. In July 2010, President Obama signed a law that stopped many American electronic companies from investing in conflict minerals.

Throughout history, gold has always been an object of value. The famous conquistadors in the 1400ís and 1500ís took gold from the lands they invaded. They knew that it would bring them wealth. In the Congo, the rebel groups are mining as much gold and silver as they can, so that they can profit from it and fuel their terrorist legacy in the DRC. Gold will always ensure wealth and fortune. In China, the currency was de-valued and worth less than the US dollar. People started to buy nuggets and bars of gold so that their finances were secure. Gold is an enduring symbol of security and wealth, and unfortunately, many will do anything to control it.

Solution

There are several highly effective ways to help stop the genocide, violence and abuse in the Congo. A great way to bring awareness to the conflict is to generate informative public service announcements (PSAs). If this is done, people will be aware of the issue, and possibly want to donate funds to help stop the suffering in the region. PSAs can be effective by giving many people information regarding the gold mined in the Congo. A powerful PSA could use pictures and video clips of the actual mines in the Congo. People would then have a visual of the dangerous and harsh labor conditions that the Congolese suffer every day in order to provide the world with gold. The PSA could run on American broadcast TV, and on international news stations like CNN and the BBC, where it would be viewed by a wider audience.

Iron

Discovery

The earliest records of iron are of beads made of meteoric iron dating back to 3500 BCE. It was also used in ancient Egypt, where it was fairly important to their culture. Since the majority of the iron they had access to was meteoric, it was called 'the metal of heaven.' Iron was also used to construct tools, and in later excavations non-meteoric iron was found in the king's chamber of the Pyramid of Khufu. It was smelted down, and had traces of gold in it. This meant that at that time they, or some other civilization they were in contact with, had the ability to smelt iron.

Like iron, steel was also used by various cultures, however it was hard to make and rather expensive. In 1856, Henry Bessemer conducted several experiments to create a better furnace for burning off the carbon in the iron to get a lower percentage. The percentage of carbon within the iron determines what type of metal it will be. Cast iron is around 4% carbon, whereas most steels have less than 2%. Normally, iron ore has a great deal of other things in it besides iron. Steel is made by removing these impurities, but leaving a small percentage of carbon behind. Bessemer figured out that if the iron was kept fluid, and a continuous jet of oxygen was shot at it, the carbon and other contaminants would bond with the oxygen and leave in the form of carbon dioxide, or other such gases. This process quickly removed impurities from the iron, and slowly reduced the amount of carbon, producing a larger range of carbon percentages in steel that could be easily recreated. Burning off the carbon is essentially the last step of the steel making process, however, that is not the only way that steel is created. If the iron has less carbon than desired, it can be melted together with coke (pure carbon) to get the needed percentage of carbon. These two methods allowed steel to be created much more cheaply than it had

previously been, permitting a greater range of uses.

Chemical Properties

Iron is used primarily in building because of its many useful attributes and wide availability. It is very stable, strong, durable, and can be mixed with different elements for different applications. Most iron, such as cast iron, is fairly hard and not that malleable due to impurities such as carbon. Malleability is the ability of a metal to permanently have its shape changed and stay that way. Metals have this property because of their structure, which allows the various atoms to slide across each other with little resistance. This is due to the bonds that metals share with each other, called metallic bonds. In these bonds, each atom, instead of bonding to just one or two others, contributes their valence electrons to all of the other surrounding atoms. Because of this, they are not as strongly bonded as most

compounds, yet still stay together due to the electrostatic forces between the valence electrons and nuclear protons. They can move about more freely than in other substances due their communal bond.

When carbon is introduced into the metal, things start to change. Due to the size of the carbon atoms, they are able to situate themselves in such a way that makes it more difficult for the iron atoms to slide over each other, making the iron stronger. However, as

more carbon is introduced, the metal gets harder, becomes brittle, and can be shattered more easily. Iron is one of the most useful materials due to its many forms and multiple uses.

Historical Conflict: Industrial Revolution

Iron is related to class conflict during the Industrial Revolution. This historical period

experienced the development of new social classes, such as the industrial worker and various middle classes. Additionally, there were many technological advancements, such as the creation of the steam engine.
The Industrial Revolution was a great shift between an agricultural based economy to one based on industry. Great Britain was one of the most influential agents of change, and was responsible for the start of the revolution. This new age was ushered in by the previous Agricultural Revolution, which introduced new technologies, techniques, and policies. Some of the most important policies were enclosure laws that allowed private farmers to take control of public farms. This pushed people out of more traditional jobs, and made their only real option for survival working in a factory. In factories, people had less control over how they lived, causing a great deal of unrest. Mass production using iron machinery caused many conflicts and labor issues were the driving force behind eventual changes in workersí rights.

Although the conflict was not directly about iron, it did play an important role. The main conflict during this time was between the working and upper classes over the loss of traditional jobs, low pay, and working conditions. Iron is related to this conflict because the majority of the machines of the time heavily relied upon iron to function. In addition to that, it was responsible for the large scale growth of industry. People were not necessarily fighting over the iron machinery itself, but against the owners of the machinery. With machines making production easier, owners could lower the prices of the goods created and make them widely available. However, to do this they had to cut the wages of their workers, which often caused violent reactions. Though most of these people were against the owners, some were also averse to the idea of using machinery at all. The Luddites were a group that felt that way about the machines in factories. They felt that the they were allowing the factory owners to lower their wages and force them out of their jobs. The Luddites broke many machines in protest and attempted to intimidate owners into raising wages. The majority of these people, as well as others who despised the machines, were either working artisans, and feared the machines eventually putting them out of their jobs, or had already been put out of their jobs.

While there might have been alternatives to many of the small conflicts during this time, it would be impossible for there to be no conflict at all during the Industrial Revolution. Each side of the issue had conflicting opinions about what should happen. With the Luddite uprisings, the Luddites wanted higher pay, and for machinery to play a smaller role in production. Factory owners wanted maximum profits, including the reduction of wages. All sides felt strongly about their beliefs, causing the Luddites to get increasingly extreme with their actions, and the owners to

become less inclined to change anything. However, the largest cause of the many conflicts during the Industrial Revolution was the time period itself, and the change from an agricultural society to an industrial one. In such a radical change, it is only natural that some people will have less satisfactory results than others, spurring them to take action. Because

the desires were polar opposites, it was essentially impossible for there to be no conflict within that time-frame.

Contemporary Conflict: Ship Breaking

Ship breaking is the process of taking broken ships, disassembling them, and removing all harmful chemicals. Ninety seven percent of a ship is reusable and broken down to help build new ships or buildings. While this process is not controversial, the policies of governments implementing it are. Originally, ship breaking was carried out in developed nations who had the needed resources and regulations to carry it out safely. However, in recent years, several developing nations such as India, Pakistan, and Bangladesh have started ship breaking yards. These countries lack laws that protect workers rights so they can offer prices lower than those of ship breaking yards in developed nations. The conditions are terrible, and the workers have few tools or reliable safety equipment to work with. The dangerous substances within the ships, such as asbestos and mercury, spill out unchecked and cause harm to the workers as well as the environment. Even with all this hard work, the workers are paid a very small amount. This has provoked a strong reaction from those concerned about the environment and workers rights.

Ship breaking and factory work during the Industrial Revolution share an important historical connection. During the Industrial Revolution, the factory workers were barely given enough money to live on, and struggled to buy food and shelter. The same is true of those working in ship breaking yards; the average worker makes less than one US dollar per eight hour shift, though often they work even more than that. Likewise, during the Industrial Revolution, it was quite common to work twelve or more hours a day for only subsistence wages. In addition to that, death and injury are common to both eras because of the awful working conditions. During the Industrial Revolution, all of the machinery was out in the open, and closely packed, leading to injuries because of moving parts. Also, the fumes made workers groggy and slow down. In ship breaking yards, many injuries happen due to mistakes with blowtorches in hulls filled with oil fumes. This made both environments extremely dangerous and deadly.

Iron plays a key role in both of these conflicts. During the Industrial Revolution, it allowed for the development of more complex machinery.

This machinery caused a major increase in production ability and productivity, which helped fuel the growth of industry. In the case of ship breaking, steel is the key material that makes up the hulls and frames of ships. This steel can be melted down and sold for a profit. However, the process of removing it can be difficult for those with insufficient tools, and can be harmful when other substances in ships are involved. Steel is composed mostly of iron, which is the driving factor for both of these conflicts.

Solution

The best solution for the ship breaking problem would be to start enforcing the previously set European treaties that prohibit and regulate the movement of hazardous materials. These treaties, which limit what can be transported and how, would help deal with situations where developed countries send waste to developing ones. However, if this policy

was broadened to include the entire developed world, and was enforced, it would benefit some of the more dangerous ship breaking yards. Developed countries would have to remove hazardous materials from ships before sending them to ship breaking yards. With less hazardous materials, there is a smaller chance of short and long-term injuries or environmental damage. This would not negatively effect those in ship breaking yards, because all of the inspections would be done in the developed countries, before the ships are sent overseas. That means that the costly process of removing the dangerous substances would be done at the expense of the ship owner, instead of those in the yards.

Another solution is for local governments to create standards for working conditions in ship breaking yards. These standards would limit maximum work hours, provide a minimum wage, safety equipment, better tools, and limit the amount of dangerous materials allowed in ships when they are received. Organizations such as Green Peace have been pushing for standards such as these, and have succeeded with yards in India. Unfortunately, this solution causes another problem. In India, which already made changes, many ship yard owners and potential business partners left due to the increase in expenses. This would not be an issue if developing nations with ship breaking yards had the same rules and regulations. The general work standard will rise, and no one country would have an advantage over another. The gross domestic product should rise as well because businesses would be justified in raising their prices. For governments that need help with regulation and enforcement, the UN and other specialized organizations should provide aid. This would take a great deal of work and negotiation. All sides of the issue would have to agree, and devote at least a portion of their time to improving the situation. Unfortunately, some viewpoints differ and, because of this, the problem lives on.

Lithium

Discovery

In 1817, Johan August Arfvedson discovered lithium in a sample of ore from a Swedish iron mine. In 1818, Sir Humphry Davy and William Thomas Brande managed to isolate lithium using electrolysis. Lithium chloride, (LiCl) is commonly found in seawater. The isolation of lithium works by taking dissolved LiCl solution and passing an electrical current through it. The current separates the lithium and the chlorine gas.

Philosophers initially used lithium in 200 AD to treat mental diseases such as mania and bipolar disorder. Mania is a disease that amplifies emotions from subtle to dramatic. The discovery of lithium isolation led to its use as a medicine to treat depression in bipolar disorder. Surprisingly, we still do not know why it works to reduce the dramatic effects of bipolar disorder, mostly because our emotions, powered by intricate electrical patterns in our brain, are barely understood by scientists.

Chemical Properties

Lithium is an element that is quite soft, and can be scratched with a fingernail. It is the lightest metal on the periodic table, and only has one valence electron. This causes it to scramble at any opportunity to get rid of it, making it highly reactive. Lithium has a lot of

energy, mainly because it is always searching for something to react with. This reactive nature made lithium a useful element for hydrogen bombs (H-bombs). H-bombs work by fusing two hydrogen isotopes together, releasing a massive amount of energy in the process. It is the same reaction that takes place in the sun. The explosion of an H-bomb is ten times stronger than the atomic bomb used on Hiroshima.

The H-bomb contains an atomic bomb at the tip, as well as a compound of deuterium - a hydrogen isotope with one neutron - and lithium, called lithium deuteride. Lithium, because of its high reactivity, exchanges neutrons with the hydrogen created from the atomic bomb's explosion, creating tritium, an isotope of hydrogen with two neutrons. The atomic bomb's energy is enough to actually fuse the two hydrogen isotopes, tritium and deuterium, together to create helium. Helium is a noble gas, and exists in a lower energy state than the reactants. The excess energy is released during fusion, causing the massive explosion the hydrogen bomb is famous for.

Historical Conflict: Nuclear Arms Race

The nuclear arms race occurred between 1945-1991. It was a period of time when two rival countries, the United States and The Union of Socialist Soviet Republics (USSR), were in a frenzy to create and own as many weapons as possible. The nuclear arms race was influenced by events in World War II. After the US dropped an atomic bomb on Hiroshima, Russia, one of the USís allies, became fearful of its power. Soon, control over post-war Europe was in dispute. Suspicions grew as the Soviets designed a nuclear weapon of their own and tested it in 1949. Shortly thereafter, the hydrogen bomb pushed forward the nuclear arms race. It was tested in 1952 and its power was enormous. One year later Russia created a H-bomb of its own nicknamed Tsar Bomba; it was, and continues to be, the most powerful explosive device ever created. Its explosion was the equivalent of 50 million tons of TNT. It produced a 7.1 earthquake even though it was detonated mid-air. Having an inferior military was never an option, so the US was forced to create more weapons. These events spurred the nuclear arms race. Even though the nuclear weapons in stock
were more than enough to destroy the world over twenty times, both powers continued making more. Nuclear war was prevented because of the threat of mutually assured destruction. Both sides would have been destroyed if they tried to attack, so they did not. Eventually the leaders of the rival countries, Mikhail Gorbachev and Ronald Reagan managed to slow the arms race and agreed on restrictions and limitations on nuclear arms proliferation. The Strategic Arms Reduction Treaty (START I) was signed. It reduced the amount of all nuclear weapons by 80%. The nuclear arms race left a scar; both countries spent money on weapons that were never used, however, a worldwide disaster was successfully avoided.

One of the main reasons the arms race lasted so long was because lithium was used to make hydrogen bombs. During World War II, a scientist named Enrico Fermi proposed the idea of the hydrogen bomb--a weapon that could cause ten times the damage of an atomic bomb. The hydrogen bomb fuses two hydrogen ions to produce substantial amounts of nuclear energy. Lithium is used to create tritium, a hydrogen isotope used to create the explosion. In 1952, the US was ready to test the new bomb, nicknamed Ivy Mike. The bomb

was dropped on a small isolated island, Eniwetok Atoll. The explosion was spectacular; it left a gaping crater. It is thought by scientists such as Carl Sagan that the use of a hydrogen bomb, especially in a populated area, could create a firestorm, whipping dust and ash into the high atmosphere and preventing sunlight from reaching the lower atmosphere. Such an event is called a nuclear winter. An average nuclear winter could decrease the average land temperature from 60 degrees to 25 degrees Fahrenheit. This scenario would probably destroy most life on Earth. A nuclear winter is a very plausible idea today, created during the Cold War. Many books and comics of the time were written about it.

Two things politicians designed to end the arms race were the SALT and START talks. On May 26, 1972 the Strategic Arms Limitation Talks (SALT) were held and the United States and the USSR agreed to stop making inter-continental ballistic missiles. There were also the proposed START, or strategic arms reduction treaties. They required that all parties cut their missile supplies in half. This would have been a big step for participating countries, but a small step towards the ultimate goal. Due to the likely possibility of the other countries hiding missiles and various other reasons, participating countries decided it was too risky. It was originally proposed in the 1960ís by Ronald Reagan, but has only recently been put into action. If it was originally explored and adopted during the 60ís, the Cold War conflict could have been resolved much faster, easier, and safer.

Contemporary Conflict: Salar de Uyuni Salt Flats

Salar de Uyuni is 4,086 square miles of nothing, or so it was thought. It stretches as far as the eye can see, nothing obstructing its view. Its beauty attracts tourists and photographers from all over the world to Bolivia. Recently, South Korea, France, Japan and many other countries have shown interest in wanting to mine Salar de Uyuni. It is believed that Salar de Uyuni alone holds half of the worldís lithium under its surface. Lithium, once used in hydrogen bombs, is now used in car batteries. Lithium batteries create energy that does not require any burning. If it were mined, the world could begin to powerfully push forward a movement of green energy. However, mining the plain would come at a high price. Indigenous people who live in the region believe that they should be given a portion of the profits made from Salar de Uyuni. Mining would also destroy a popular tourist location and one of the last natural wonders of the world.

Salar de Uyuni is related to the Cold War through the element, lithium. During the Cold War the superpowers fought with lithium, and in Salar de Uyuni, it is something fought over. The unique reactive properties of this element make it ideally suited to a variety of applications from hydrogen bombs to current day batteries and electronic devices.

Solution

The best solution to the Salar de Uyuni conflict would be to create a policy in which Bolivia charges for the mining rights to portions of Salar de Uyuni. Countries that begin mining would have to pay Bolivia, which would in turn have to give a portion of the money to the natives and a portion to an environmental oversight fund. This policy would bring Bolivia out of financial debt and compensate the natives for potential damage to Salar de Uyuni. It would also provide foreign governments with the lithium they need to create the next generation of electric vehicles and other eco-friendly products.

Oxygen

Discovery

The process of liquefying a gas was discovered by Michael Faraday in 1845. He found that if a gas is cooled by bathing it in ether and dry ice, then pressurized, it turns into liquid. Polish scientist Karol Olszewski used a compressor he built with another Polish chemist, Walery Wroblewski to also successfully liquefy oxygen. They compressed and cooled the air so that the gases in the air would become liquid. They then increased the temperature, turning the nitrogen in the air into gas, leaving only liquid oxygen behind. They found that oxygen condenses at 90 degrees Kelvin. When war broke out in the 20th century, liquid oxygen took on a new role. Wernher von Braun was a German scientist who used liquid oxygen to fuel missiles.

Chemical Properties

Earth has an atmosphere mostly comprised of oxygen and nitrogen, which both exist as diatomic gases. At the poles high energy particles, usually electrons, called the solar wind interact with atmospheric oxygen and nitrogen and create the northern or southern lights. The aurora is due to atomic line spectra of the atmospheric gases. When an oxygen molecule absorbs energy it causes an electron to jump to a higher energy level. When the electron falls back down to the lower state it releases the energy in the form of a photon of light. Oxygen emits photons with wavelengths corresponding to green and red light.

Oxygen is an oxidizer, and helps keep a fire or flammable material lit, but does not combust on its own. A combustion reaction requires a fuel source, heat and an oxidizer. If a flaming match or paper were stuck in a jar, it would stay lit as long as there was still oxygen within the jar. The fire would eventually die out due to oxygen deprivation. Oxygen itself is not combustible, even at high amounts; it only supports the flame. The products of a combustion reaction are usually carbon dioxide and water vapor.

Historical Conflict: World War II Rockets

Liquid oxygen is related to the V-2 rocket program during World War II. This was the largest war in history and reshaped the political structure of the world. It also introduced hundreds of new technological breakthroughs, such as the creation and evolution of destructive bombs. Nazi Germany caused World War II by invading countries in Europe in a campaign for global dominance. Germany claimed that it needed 'lebensraum' - which means living space, and threatened nearby countries. Poland was the first country that was invaded, and was immediately defended by France and Britain. Shortly thereafter, Germany betrayed its ally, The Soviet Union, which later played an instrumental role in defeating Germany as one of the Allied powers. This war raged throughout the late 1930's and the early 1940's until Japan attacked Pearl Harbor, which brought the US into the fight against the Axis Powers (Germany, Italy and Japan). Japan quickly surrendered after two of their cities, Nagasaki and Hiroshima, were bombed by the US and left decimated. With the help of American forces, Nazi Germany fell as the Allies seized Europe and finally got a foothold against Germany.

Liquid oxygen was used as a propellant in V-2 rockets during World War II. Wernher von Braun, father of the V-2 terror rocket of Germany, introduced liquid fueled rockets in 1939.

Braun combined liquid oxygen in a chamber with methanol, or some other flammable alcohol. Inside this chamber, the compounds were mixed, creating the fuel for the rocket. The propellant mixture was advanced for that time and was used to create a horrible weapon: the V-2.

The V-2 rockets were very destructive and killed thousands of people. However, they were inefficient because of their inaccurate guiding system. There was not much benefit to the rockets because of this inaccuracy. The primary benefit was the technological advancements made in rocketry. Without rocketry and jet propulsion, we would have never reached the moon. There were many improvements with regard to the mixture of liquid oxygen and other flammable liquids, such as the different combustion chamber designs. Another improvement was the guiding system. The guiding system created during the 1939 to 1945 V-2 program was a grand improvement to rockets as well; the V-2 rocket used a guiding system that controlled the rocketís direction and stopped its engines when it reached the right velocity. Although the benefits were technological breakthroughs, such as the make-up of the rocket, the killing of thousands of people greatly outweighed the benefits.

Contemporary Conflict: Iranian Missile Program

Liquid oxygen relates to the issue of nuclear proliferation in the Middle East. Since 2003, Iran has been suspected of creating nuclear weapons with a hidden uranium enrichment plant. It has also launched various types of rockets, such as the Shahab-3, which could be used as delivery systems for nuclear weapons. It has the capability of reaching Israel and other targets within an 807 mile range. In 2003 the United Nations (UN) and the International Atomic Energy Agency became suspicious of Iranís new enrichment plant and assumed it was designed for weapons. UN inspectors were dispatched to supervise what was happening inside the facilities and Iranian President Mahmoud Ahmedinejad assured that the facility and the actions taking place within it were solely meant for ìpeaceful purposesî, such as electricity and power. That claim has been used throughout this controversial debate to refute countries who believe that Iran is producing weapons grade uranium. As of now, this claim of peaceful purposes is true because Iran lacks the technological capability to produce a nuclear bomb.

Solution

A solution to Iranian nuclear proliferation is to enact moderate restrictions on Iran's oil and iron. Iran should be prevented from extensively creating and improving its mechanical enrichment assets for power plants. Iran is a developing country and it is against the Universal Declaration of Human Rights (UNDHR) to completely strip them of their needs to further develop because of unfounded allegations, but moderate restrictions are in order and do no violate the UNDHR. Since it is a fact that Iran does not have the technological capacity to create bomb fuel with enriched uranium, there is no point in completely restricting all its necessary resources. If the United Nations is worried about a potential nuclear threat, they should only restrict Iranís ability to mine, trade, and enrich uranium. Even if Iran were to create a nuclear bomb, the UN would find out by means of investigators that are constantly checking up on them, thus resulting in possible war or tension with countries such as Israel and the US.

As a suggestion for the UN, restricting Iranís ability to enrich uranium for bombs and not their resources entirely would be a wise action.

Uranium

Discovery

In 1789, a German chemist named Martin Heinrich Klaproth announced that he had discovered uranium. Klaproth analyzed a black powdered mineral called pitchblende and isolated traces of uranium by melting it. He incorrectly called his discovery uranium, it was actually uranium dioxide. It was not until 1841 that French scientist Eugene PÈligot isolated uranium from that compound. PÈligot noticed that uranium dioxide reacted in an unusual manner with uranium tetrachloride. PÈligot heated the uranium dioxide with potassium in a platinum crucible and was able to isolate pure uranium.

In 1896, Antoine Henri Becquerel accidentally discovered that uranium is radioactive. He wrapped uranium with potassium uranyl sulfate and placed it on photographic plates wrapped in black paper and exposed the bundle to sunlight. When developed, the plates revealed an image of the uranium crystals. Initially, he believed that the sun's energy was being absorbed by the uranium which then emitted X -rays. But when other tests were conducted the next year, it was overcast and he put the experiment in a drawer. A few days later, when he went to check up on the photographic plates, he only expected to see a faint image. Instead he was able to clearly see a photograph of the uranium crystals. Becquerel concluded "that the phosphorescent substance in question emits radiation which penetrates paper opaque to light." This led to the investigation of radioactivity.

After his discovery, two other scientists decided to look into radioactivity. Marie and Pierre Curie, a French/Polish couple, discovered that radioactivity had to do with unstable isotopes. After chemical extraction for the uranium ore, Marie noted the residual material to

be more ìactiveî than the pure uranium. It had a different amount of rays and the atoms acted differently than pure uranium atoms. She discovered that within pitchblende there were new elements that were also radioactive. She named the new elements polonium and radium. In 1911 Marie Curie was awarded the Nobel Prize for her work on radioactivity.

Chemical Properties

Uranium is a hard, ductile, silver white, radioactive metal used for various purposes such as generating power. Uranium in microscopic amounts is found in the atmosphere, the water, and the soil. Radioactive decay occurs when unstable isotopes spontaneously disintegrate, emitting both particles and energy as they transform into more stable atoms. Isotopes are atoms of an element that have different numbers of neutrons. Radioactive decay is measured b

half-life. One half-life is the amount of time it takes for half a sample of a radioactive isotope to decay into more stable products. The half-life of the uranium 235 isotope is 710 million years. Its radioactivity makes it valuable because when it goes through a nuclear chain reaction, it can release a huge amount of energy which can be used for generating electrical power or

nuclear bombs. Its compounds are highly toxic, both from a chemical and radiological standpoint.

Uranium 235 is used to make an atomic bomb. Unlike other isotopes, such as uranium 238, uranium 235 can sustain a nuclear chain reaction. Fission happens when an uranium 235 atom is bombarded by neutrons released from a neighboring uranium 235 isotope, which causes it to split apart and creates new elements. In order to sustain a chain reaction, the isotope needs to be enriched to 40%. To enrich means to increase the concentration of one isotope. Enriching is accomplished by isotope separation.

If the reaction does not stop, then the uranium will reach critical mass and split apart, which causes fission energy to be released. The newly formed atom is Thorium 231. In a nuclear bomb, the uranium 235 is used to create a huge explosion of energy.

The first uranium bomb, ëLittle Boy,í used this process but in a different way. The core was made of enriched uranium 235 and was surrounded by liquid explosives. When the liquid explosives blew up inside the bomb, the neutrons created by the explosion bombarded the uranium, starting a nuclear chain reaction. Once the uranium 235 reached critical mass, the atoms split apart and exploded the bomb, destroying everything within a 6,000 mile radius. Little Boyís explosive power was equal to between 13 and 18 kilotons of TNT.

Historical Conflict: Nuclear Arms Race

Uranium was an important component of the Nuclear Arms Race. During the Nuclear Arms Race, the United States (US) and the Union of Soviet Socialist Republic (USSR) created powerful nuclear weapons and competed for military supremacy. This conflict involved many countries around the world, but was mainly between the US and USSR. When the USSR realized how strong the US had become because of the nuclear bomb, the USSR began to make bombs as well. When the USSR had a stronger bomb, the US decided it had to increase its number of bombs because it was afraid of being attacked by the USSR. The US took more time to create smaller more powerful weapons, whereas the USSR made as many nuclear bombs as they could despite their overwhelming effectiveness. Each side continued this escalation for 50 years. The whole world expected a nuclear war to begin. In 1995, the US and USSR signed the Strategic Arms Reduction Treaty (START), which stopped all production of nuclear arms and initiated the dismantling of the majority of existing nuclear arms.

Without uranium, neither the US nor the USSR would have been able to create the nuclear bomb. In 1938, a German scientist named Ernest Rutherford discovered that continuous bombardment of one atom of uranium with multiple neutrons would split the atom and create a huge amount of energy. The type of energy that comes out of the atom is usually kinetic and exothermic. The nuclear bomb has an uranium core surrounded by liquid explosives. When the liquid explosives detonate the uranium core reaches critical mass and explodes. Since uranium is an abundant natural element, both the US and USSR were able to produce many weapons and create an arms race. The discovery of gamma rays led to the nuclear bomb, as well as advanced military weapons, and energy resources. Currently,

the US faces multiple problems because of the development of the nuclear bomb. Both the US and Russia hold at least 95% of the worldís nuclear supply and they have enough nuclear

arms to blow up the Earth five times over. One benefit of the nuclear arms race for the US was the development of a strong military, with military bases located throughout the world. However, some organizations and countries resent the US because they feel threatened by the presence of a foreign military within their borders. For example, US power and military presence has contributed to the creation of anti-American terrorist groups, like Al Queda, who resent and feel threatened by US influence, especially in the Middle East.

Contemporary Conflict: Iranian Nuclear Program

The United States and its allies are now concerned that Iran is producing nuclear material for use in weapons. This would destabilize the Middle East and is likely to increase the risk of terrorists obtaining nuclear weapons. Earlier in 2010, Iran successfully enriched uranium from 4% to 20% concentration in a hidden nuclear reactor in Tehran. In doing so, Iran broke the Non-Proliferation Treaty (NPT) of the United Nations. The NPT is intended to ensure that countries with nuclear material do not enrich uranium for the purpose of making nuclear weapons. It does, however, allow and encourage peaceful use for nuclear power. When the European countries accused Iran of trying to create a nuclear bomb, Iran claimed it was enriching uranium for energy use. The US was skeptical because Iranís leader, Mahmoud Ahmadinejad, proclaimed he wanted to ìwipe Israel off the map.î Israel feels its security is being threatened and its leaders have said if Iran makes nuclear weapons, they would bomb Iran. New information from the International Atomic Energy Agency (IAEA) suggests Iran will be able to enrich uranium to a sustainable percentage that could be used in a nuclear weapon in less than one year. However, it would take Iran 5 to 7 years to find the materials capable of making a working atomic bomb. The IAEA doubts that Iran could acquire the materials to make a bomb or that the nuclear reactor in Tehran is capable of making one.

The Iranian nuclear program relates to the Nuclear Arms Race because the US, Russia and Iran are using uranium to gain geo-political power. Iran is currently enriching uranium to gain leverage over Israel and assert regional power. Likewise, during the Cold War, both the US and USSR used nuclear weapons in a struggle for global dominance. Both countries were locked in an arms race which produced the capacity to destroy the Earth five times over. If Iran starts its own nuclear arms race, the consequences would be unpredictable. It might encourage other countries to manufacture their own nuclear bombs and could place the world on the brink of nuclear war again.

Solution

One solution to the Iranian nuclear program is to improve upon an agreement Brazil, Turkey, and Iran made earlier in 2010. In this agreement, Iran would give Turkey and Brazil its low-level enriched uranium in exchange for high-level enriched uranium from Russia and France. The United Nations revoked the agreement because it did not allow the UN to see how much uranium Iran has, or determine how it was to be used. If Iran gave all its low-level enriched uranium in exchange for high-level enriched uranium, then the UN would approve the agreement because it would be able to see how much Iran has and be able to see for what purpose Iran is using its uranium. The agreement made by Brazil and Turkey would allow for Iran to ship 2,640 pounds of low-level enriched uranium to be stored for safe keeping. This

would allow Iran after one year to receive 265 pounds of enriched uranium from France and Russia. After negotiations had taken place, all 6 of the major powers (United States, Great Britain, France, Germany, Russia, and China) decided to impose new sanctions on Iran and revoked the agreement between Iran, Brazil, and Turkey. Iran could make changes to the agreement so that the UN would approve it. One way would be for Iran to ship out all of its low-level enriched uranium to both Turkey and Brazil. In return, Iran could receive about º of what it originally had in low-level enriched uranium, converted into high-level enriched uranium from Russia and France. This way, the UN and the IAEA would be able to monitor what Iran is using the high-level enriched uranium for. Iran will then have access to high-level enriched uranium to use for energy needs.

Caffeine

Discovery

German chemist, Friedlieb Ferdinand Runge, was the first to isolate the caffeine molecule. In 1820, he found that by adding methylene chloride to coffee, he could extract a solid white substance. He named this substance caffeine.

Caffeine is commonly found in many products such as soda, coffee, tea, and chocolate. It is a mild stimulant used for a quick energy boost. In plants, it functions as a natural pesticide.

Chemical Properties

Caffeine is made up of carbon, hydrogen, nitrogen and oxygen. It is an organic molecular compound commonly found in plants like tea and cocoa. After the caffeine molecule enters the body it binds to the adenosine receptor. This receptor usually binds adenosine created in the brain causing drowsiness. The caffeine molecule affects adenosine receptors because it is a non-selective antagonist with the opposite affect of adenosine, acting as an inhibitor. Caffeine has amine, amide and alkene functional groups that help the caffeine to bind to the adenosine receptors. Once the caffeine inhibits the receptors they cannot bind to their usual substrate, adenosine. Without the stimulation of the adenosine receptors the pituitary gland releases hormones that tell the adrenal glands to start producing adrenaline. The adrenaline then causes the liver to release sugar into the body, energizing it.

Historical Conflict: Opium Wars

From the mid 1700ís to the late 1800ís, Great Britain illegally traded opium to China. Britain traded opium in order to get money to buy tea. Before it decided to trade opium, Britain

had been trading large amounts of Spanish silver for tea, but when the Spaniards sided with the American Colonies in their war for freedom from Britain, Spain stopped its supply of silver. In order to keep receiving tea from China, Britain had to start trading its own gold and silver. This was when it decided to try trafficking opium into China. Britain grew opium in its colony,

India. As the popularity of opium grew, so did the number of opium addicts in China. The addiction rate grew so high that China cut off its trade with everyone hoping to stop opium from getting into the country. The British, still wanting tea, attacked China. They were successful in taking over a large part of southern China and killed many members of the Chinese military when they fought back.

Caffeine in the form of tea became popular in Britain in the early 1700ís. It was first traded through the Dutch from the Chinese. Even though it was so expensive, tea was a hot commodity in Britain. The British government charged a tax of 119% on tea, which brought in about an eighth of Britain's annual revenue. In order to obtain tea from China, Britain illegally traded large amounts of opium, addicting over 10% of China's population. Britain went so far as to wage war on China to obtain tea.

The illegal trafficking of opium to China had many negative consequences. The large number of opium addicts had an adverse affect on communities and workplaces. This caused a wave of poverty in China. There were also over 200,000 casualties on the Chinese side when the British took over China. The Opium Wars led to multiple unfair trade treaties with America, Britain and France, causing China to spiral further into poverty over the next few decades. A slight positive consequence of the conflict was that through colonization Britain helped China emerge from its isolationist past.

Contemporary Conflict: El Salvador Civil War

The El Salvador Civil War started thirty years ago in 1980. It was a war between the military-led government of El Salvador and five liberal militia groups together called the Farabundo Martì National Liberation Front (FMLN). The United States sided with the Salvadoran government because it believed that the FMLN were part of a communist conspiracy with Soviet Russia. Before this conflict, 85% of the land in El Salvador was owned by less than two percent of the population. The majority of land was used for coffee and sugar plantations owned by the upper class. This meant that there were a small percentage of extremely wealthy people and the rest lived in poverty; there was not much of a middle class. The government in El Salvador was corrupt and ruthless. During the war it assassinated many important people, including Archbishop Romero and five priests. Religion was important to society in El Salvador so the assassination of religious leaders had a large effect on the public. The government assassinated Romero because he was telling the US not to support the corrupt government of El Salvador.

The Salvadoran Civil War and the Opium Wars were similar in that both conflicts were caused by cash crops like coffee and tea. They were different because the Salvadoran Civil War was about one country at war with itself, while the Opium wars were about the Chinese fighting an imperialistic foreign power. Also, the consequences of the Opium Wars were severe; 230,000 people died and the country spiraled into turmoil for decades. In contrast, there were positive consequences to the civil war in El Salvador. Small farmers were granted more land and there were governmental reforms.

Solution

As seen in many instances, civil wars pull countries apart and ruin the lives of people

within them. We can make a difference by educating people about countries currently experiencing internal conflict, like the Civil War in Chad and the Somali Civil War. In order to educate people we can have a writing contest called the Writing for Peace Contest. This could be a monthly contest in which people write short stories from the perspective of each side of a civil war. There could be an entry fee of 50¢ and the winner of the contest would get half of the proceeds as a prize and choose which charity the other half goes to. In order to win the contest, the stories should demonstrate evidence of research on the topic. The stories would be a minimum length of three pages and the contestants would be given three weeks to research and write the stories before judging. Contest winners would be published in the school newspaper and possibly community publications as well.

Carbon Dioxide

Discovery

Jan Baptista Van Helmont first discovered carbon dioxide in the 17th century. He discovered it by burning coal and observing that the gas emitting from it was distinct from air. Air consists of different types of molecules such as oxygen, nitrogen, and carbon dioxide. Carbon dioxide is a relatively inert molecule because it does not react in combustion reactions like oxygen. The molecules in air do not react with one another; they simply exist in the atmosphere.

Helmont died in 1664. It was not until the mid 17th century that another scientist named Joseph Black continued research on carbon dioxide. Blackís studies showed that carbon dioxide is significantly different from air. Black burnt coal over a fire and collected the gas that was coming off of the burning wood. He tested Helmontís findings by pouring carbon dioxide over a candle and noticed the fire went out. Fire depends on oxygen and this proved that carbon dioxide was a distinct gas, separate from oxygen.

Chemical Properties

Carbon dioxide is a molecule that consists of one carbon atom and two oxygen atoms. It exists as a gas at room temperature, and enters the atmosphere naturally through volcanic activity and animal respiration. Under volcanoes, limestone or carbonate rocks are crushed by opposing tectonic plates and break down releasing carbon dioxide into the air. It remains in the atmosphere as a greenhouse gas and absorbs infrared radiation from the sun and Earth. Carbon dioxide re-emits absorbed heat keeping the atmosphere warm. The more carbon dioxide added to the atmosphere, the more heat becomes trapped. Carbon dioxide lasts in the atmosphere for approximately 200 years. When carbon dioxide in the air is dissolved in the oceans and lakes it creates carbonic acid and the water becomes more acidic. This phenomenon is known as ocean acidification. As the pH drops it affects shellfish and other organisms with calcium carbonate shells. Increasing acidity causes calcium carbonate to dissolve increasing the risk of predation. Ocean acidification has become more apparent in the last few years and could have significant effects on aquatic ecosystems.

Carbon dioxide naturally occurs in the atmosphere. Plants absorb it during

photosynthesis and use it to produce energy and tissue. Animals consume plants and when plants and animals die, the carbon goes into the ground where intense heat and pressure forms oil and carbonate rocks. Carbon is re-released as carbon dioxide gas from inside the earth through volcanoes and combustion reactions, and the cycle continues.

Historical Conflict: Industrial Revolution

The Industrial Revolution is the foundation of today's economy. It was a long process that occurred between the late 18th century and early 20th century and it changed the way people live. During this revolution inventions were made, many factories were established, and cities grew. New social classes were formed like middle class businessmen, wealthy owners, and poverty stricken workers. The enclosure laws were a huge step forward in the Industrial Revolution. The laws made public land available for private ownership. People who farmed on public land had to move and find jobs elsewhere. These people typically were forced into crowded cities working for subsistence wages. As factories grew cities did as well. Population in Britain went from 4 million in the1600's to about 5.5 million at the turn of the century.

Carbon dioxide is directly related to the Industrial Revolution because large quantities were created during that time. When the Industrial Revolution started, many machines were invented including steamboats and locomotives. The main energy source for these machines was coal. When coal is burned it produces carbon dioxide, which is released into the atmosphere. No one knew what effect it would have on the environment, but soon people found out. In the year 1752 a phenomenon happened in London called The Great Smog. The city became completely covered in smog, the effect of carbon dioxide and soot mixing with cold air. This lasted about 4 days until it cleared up. This event was only the start of the damage that carbon dioxide emissions would cause.

The benefits of the Industrial Revolution did not outweigh the environmental consequences. This revolution brought many good things to the table - engines, cars, trains, and other new technologies. These inventions revolutionized transportation, but they also had a significant effect on the future of the planet. Humans created pollution during the Industrial Revolution and it has taken a devastating toll on the environment. Over the past few hundred years different species of the arctic wildlife have had their homes destroyed due to global warming. When the Earth heats up it can make ecosystems uninhabitable and species become extinct. Pollution adds to existing greenhouse gases, causing the gases to become thicker and more heat becomes trapped inside. This is serious because the trapped heat causes the world to warm up and is the cause of global warming.

Contemporary Conflict: Ocean Acidification

Ocean acidification is a growing problem. In the past century, the pH level of the ocean has changed from 8.179 to 8.104. This may seem like a slight change, but small changes in pH can have significant impact on delicate ecosystems. The ocean absorbs carbon dioxide from the atmosphere. When the amount of carbon dioxide in the air rises, it increases the partial pressure of carbon dioxide in the atmosphere, which increases the carbon dioxide dissolved in the ocean. This causes the ocean to become more acidic because carbon dioxide

lowers the pH of water. There is scientific debate about whether the increase in atmospheric carbon dioxide is happening naturally, or whether humans are contributing. Neither side has solid proof on whether or not ocean acidification is happening naturally, but significant evidence exists that suggests human activity is accelerating the process.

Those that believe that humans are contributing to ocean acidification are concerned that it is not natural and is caused by pollution.

Fossil fuel combustion and industrial factories release over six billion metric tons of carbon into the atmosphere each year. When humans overproduce carbon dioxide, it affects both the atmosphere and the ocean. The amount of carbon dioxide in the atmosphere has already increased the acidity in the ocean by 30%.

Those who believe the build up of carbon dioxide in the atmosphere is the result of a natural process think that ocean acidification is increasing because the Earth goes through natural cooling and warming cycles. During the Medieval Warm Period that lasted from AD 950ñ1250, the atmosphereís temperatures were much higher compared to now. Some people believe that the pH levels of the ocean are decreasing due to a natural increase in atmospheric carbon dioxide. Geological studies about prehistoric climates have produced a lot of information about our past. Twenty thousand years ago there was an ice age. The whole Earth was covered in glaciers and it was extremely cold. This ice age ended by the greenhouse layer being created by carbon dioxide emitted from volcanoes. The greenhouse layer keeps the heat from the sun inside the atmosphere. When the Earth slowly started getting a little warmer, the climate changed and the ice melted. This is a natural part of what the Earth goes through and provides geological evidence that ocean acidification has happened before and could be happening naturally once again.

These natural fluctuations provide evidence for those that believe we are not affecting the climate. Both sides of the conflict approach this with scientific studies, but there is no actual proof of its root cause. What is apparent is that the oceans are becoming more acidic and it would be prudent to slow the change as much as humanly possible to avoid extreme outcomes in the future

Solution

Global warming is a serious problem. Many people are uneducated about the science behind it and what is going on. If people knew that they could have a positive effect on global warming then perspectives would change and the world would stand a chance against this crisis. The Global Warming High School Course (GWHSC) would help teens understand the power they hold in the future of the planet. This course is extremely important for teenagers because they need to know that when they go out into the world they can help it become a better place.

The course would consist of recent research on global warming, what students can do to help, and different activities they can do to help empower people outside of school. The students can participate in a recycling contest. The contest consists of two rules: Recycle as much as you can and donate the money received to a charity cause. In the end, whoever donates the most money will receive a prize. Although this course would only last a semester,

students could use their knowledge of the world to help others. To eliminate a large amount of the greenhouse gasses, the students will be encouraged to ride their bike to school once a week for extra credit in one of their classes. If lots of people got in the habit of riding their bike to school, this system could catch on and become a worldwide act against global warming.

Cellulose

Discovery

In 1818, French chemist Anselme Payen extracted cellulose from plant matterñspecifically trees. He was the first to explore the components of wood using nitric acid, a strong acid that can break down large molecules and chemically age wood. He found a fibrous substance and named it cellulose.

Cellulose is the main ingredient in many products including: nitrocellulose, a flammable compound also known as guncotton; rayon, a fiber for textiles; celluloid, a thermoplastic; and cellophane, a thin film.

Chemical Properties

Cellulose is an organic compound with repeating glucose monomers. It is a linear polysaccharide polymer containing hundreds to tens of thousands glucose monosaccharide units. When a plant goes through photosynthesis, it creates a glucose molecule, which can be used by the plant for energy, stored, or turned into cellulose. When the plant chooses to turn glucose into cellulose, it links the molecule with other glucose monomers, creating long polymers through a dehydration reaction. The two ends of the sugar connect with the removal of a water molecule. Plants need cellulose because it is structurally important for their cell walls.

Plants create cellulose when they grow. The average plant contains around 33% cellulose; however, cotton is 90% cellulose. Cellulose makes plants flexible and strong. The cellulose chains can stretch and become straight, just like spaghetti noodles. In the polymers there are alcohol (OH) groups that act like magnets and pull separate strands together. This ëstickinessí is called hydrogen bonding. Oxygen is very electronegative, due to a high proton to electron shell ratio. Oxygen atoms like to pull in electrons from adjacent atoms, creating an unequal distribution of electrons, also known as a polar bond. The unequal distribution of electrons in bonds creates partial positive and negative charges. Since oxygen atoms have a lot of electron density around them, they are partially negatively charged and like to attack things that have partial positive charges. A partially negative oxygen atom will be attracted to a partially positive hydrogen atom on another cellulose strand creating a hydrogen bond. This cross links the cellulose fibers and gives additional strength and flexibility to plants.

Historical Conflict: British Imperialism in India

Great Britain became financially interested in India in the late 1600ís when a group of monopolies incorporated themselves into the East India Trading Company. The East

India Trading Company established many posts located on the east and west coasts of India. These posts facilitated the trade of indigo, cotton and opium. In 1717, Britain achieved a royal dictate from the emperor of India, Bahadur Shah Zafur, stating that India had to pay for all its exports and imports. The emperor of India agreed with the contract because he feared Britain's military power. However in 1757, India fought Britain in the battle of Plessey because Britain wanted to convert them to Christianity. When India lost, Britain wanted India to pay for the cost of going to war, the weapons it lost, and the suffering people experienced. India lacked money, so it offered Britain control over its land and business. Before long, Britain had complete power over India. After numerous battles similar to the battle of Plessey, India finally gained independence from Britain in 1947.

India and Britain started trading cellulose in the form of cotton in 1854. India produced

large quantities of cotton, which was then purchased by Britain at a low price. There were eighteen cotton mills in India in 1854. As the value of cotton went up, the profits allowed India to modernize. Indians began to receive better public education, public healthcare, and they built over 40 new railroads. The value of cotton was extremely high in 1914, which benefited India during World War I. Cotton was exported and used for fabrics worldwide and India became the fourth largest cotton producer. However, once the war ended, the price of cotton dwindled. In 1928, Britain was receiving 1456 million yards of cotton annually, but by 1932 it received a meager 376 million. India still produced cotton, but exported it at a much lower rate.

India's independence was achieved through the efforts of Mahatma Gandhi. Gandhi was born in India, studied in London, and later lived in South Africa. He returned to India to help free it from British imperialism by leading a non-violence movement. Indians desired independence on account of the way the British treated them. The British tried to convert the Muslims and Hindus to Christianity, and they held significant economic power which lead to systemic racism. For example, a British citizen would be paid ten times more than an Indian with the same job. Gandhi was aware of these issues. Upon his return to India, he promoted a movement based on the concept and philosophy of "Satyagraha." This is the belief that truth and peace are more effective weapons against oppression than physical violence. He referred to Satyagraha as a "love force." As Gandhi wrote, the "object is to convert, not coerce the wrong-doer." For example, Gandhi organized the Salt March in 1930, in response to a British sales tax on salt. Salt was an important commodity, and Britain made it illegal for Indian citizens to produce and sell it. This affected India significantly and many Indians could not afford it.

Gandhi decided to start a work stoppage against the salt tax. This type of resistance, along with protests, slowly led to India's independence once again.

Contemporary Conflict: Child Labor

Child labor in cotton factories is still a big problem in China today. Many agencies and factories prefer child laborers because they can do the same amount of work for a cheaper price. The working conditions in these factories are hazardous. Children work with dangerous machines for more then twelve hours a day with no supervision. Children are punished and

abused for being off task. They feel forced to work because of their lack of quality education, and to support their families. In exchange for their child's labor, companies promise poor families a great education and a decent job for their child. To ensure a cheap labor force, companies often offer clothes, extra money and cows along with a false promise for a better life.

British Imperialism in India and child labor in China both involved cotton production, however, the outcome of both situations is different. Under British control, Mahatma Gandhi in 1942 led a "No Violence Movement" securing India's independence, while child labor is still dispersed worldwide. There is yet to be a solution, as locations of factories using child labor now are hard to find.

Solution

In order to eliminate child labor, the governments of third world countries need to agree on policies that implement quality education. The governments of these countries need to budget money to fund schools and provide children with better education opportunities. This would solve the economic incentive of sending children to work, because poor education and lack of job opportunities force families to send their children away for a 'better life." The United Nations (UN) estimates that an average of fifteen million additional dollars for third world countries would create more jobs and reduce the number of families in poverty. This would reduce the need for families to send their children to work. In addition to economic assistance, punitive measures need to be taken. People who force children to engage in child labor should be forced to work for free and pay a heavy fine to help fund education. Presently the UN has created treaties banning child labor. If a country agrees to a treaty, UN monitors are sent to the country to enforce it. For more support, there needs to be more public awareness about child labor. Campaigns, programs, charities and organizations should provide more awareness to the people around the world. Posters, public service announcements, and merchandise such as bracelets or other items that show support should be produced. Letter campaigns to governments in third world countries may be another effective tool to create change. With these tactics in place, there will be no incentive for factory owners to engage in child labor.

Cocaine

Discovery

South American indigenous people discovered cocaine over a thousand years ago. In the early 1800ës, Germans became interested in extracting the active ingredient. Around 1860, a scientist named Dr. Carl Scherzer sent a large package of coca leaves to chemist Albert Niemann who extracted the cocaine alkaloid. To extract the alkaloid from the plant, the leaves were soaked and mashed, cocaine was then extracted as a coca-paste. Albert Niemann wrote about the alkaloid's "colorless transparent prisms" and its alkaline reaction, which means it is soluble in water and basic in nature. It has a bitter taste that promotes the flow of saliva and leaves numbness, followed by a sense of cold when in contact with the tongue.

Chemical Properties

Cocaine is derived from the shrub Erythroxylon. It is a large genus of shrubs and small trees in the Erythroxylaceae family. Cocaine is an alkaloid, meaning it has basic chemical properties and contains at least one nitrogen atom in a heterocyclic ring. Alkaloids are mostly derived from a few common amino acids, such as lysine, phenylalanine, tyrosine, or tryptophan. Cocaine is able to form different salts, and it is often shipped as cocaine hydrochloride. Different salts have different solvencies. For example, cocaine hydrochloride is polar and soluble in water. Cocaine can also be in freebase form, which is insoluble in water. No matter what kind of cocaine people consume, the effects are the same: it constricts blood vessels, dilates pupils, and increases body temperature, heart rate, and blood pressure. It is also a strong central nervous system stimulant, causing mood elevations.

Historical Conflict: Medical Era

The use of cocaine as an anesthetic was popular in the Medical Era, but its addictiveness caused conflict in the United States from 1844 to the 1970's. The Medical Era is the period of time when cocaine started to be used for medical purposes. During the Medical Era, physicians used cocaine as an anesthetic in most of their surgeries. Cocaine was also used for other medical reasons, like helping to alleviate toothaches. As it gained popularity, the addiction rate grew. The government soon noticed the problems that cocaine was causing, and decided to make it illegal. Tension grew between cocaine addicts, physicians, and the government. Physicians and the government had lost control over its distribution because cocaine was being sold and consumed in different forms, such as in Coca-Cola and cigarettes. Once it became illegal, people tried to create their own businesses to sell cocaine. Illegal trade increased to profit from the drug. Since then, many people have continued to fight over it.

Physicians played a significant role in the widespread use of cocaine in the Medical Era. Physicians found that an easy way to take cocaine was to sniff it. They told their patients about it so they could self-administer cocaine whenever they felt pain. Many people became addicted to “snuff.” Physicians also made cocaine toothache drops, which were sold over the counter in pharmacies. The use of cocaine was widespread among the working class and African Americans. Cocaine sniffing soon went from work and factories to the urban vice district, where cocaine began to assume a more deviant identity.

During the Medical Era the use of cocaine got out of control. People were abusing the drug because of its pain relieving properties and stimulating effects. Besides cocaine causing a conflict between the government, physicians, and addicts, it was also causing a racial conflict. This conflict involved African Americans. People believed most of the attacks upon white women were a result of African Americans high on cocaine. Whites exaggerated how many African Americans used it. The government finally decided to make the drug illegal. They passed the Harrison Narcotics Act, which outlawed the distribution and importation of the drug in 1914.

Contemporary Conflict: Drug Wars

The current drug wars in Mexico are alarming because many people have been terrorized or killed. The government has been trying to stop drug cartels since president Felipe CalderÛn won the presidency in 2006. Since then, drug cartels have gotten out of

control. They have killed top police commanders and innocent people. In the last four years, more than 28,000 people were killed in Mexico. Cartels have also murdered journalists to prevent stories about them. Many people who work for newspapers are scared of getting into too much detail about the violence. They fear that they could get killed as well.

The government arrested more than 50,000 people on drug charges in the past four years. Felipe CalderÛn also expanded the military from 6,000 to 30,000. However the pace of killing police commanders escalated at the same time. Mexico's drug problem is alarming for the United States because people selling drugs illegally are migrating across the border. Most people are getting killed in border cities like Cuidad Juarez, Nogales and Tijuana. Approximately 2,500 people were killed in Cuidad Juarez in one year. Mexico is not a safe country anymore, and it seems like the situation is just getting worse.

Contemporary drug wars in Mexico are similar to the Medical Era of cocaine in the early 1800's. In both conflicts, people fought to gain power and profit from the drug. During the Medical Era doctors fought the government to use cocaine for medical purposes and today drug dealers fight one another to control the illicit drug trade. Before cocaine became illegal, it was used as an anesthetic because it caused pain relief. However many people became addicted to cocaine, and the government decided the best way to stop addiction was to make it illegal. Without social support, addicts soon resorted to crime to support their addictions. In both the Medical Era and in Mexico people have died because of an addictive illegal substance. Making cocaine illegal did not solve the problems society has with substance abuse.

Solution

Since cocaine became illegal, drug wars have increased. Cartels have been fighting and killing each other to gain control of territory and trafficking routes. Between 2006 and 2010, a total of 28,299 people died due to drug related violence. Many people have questioned how we could stop these crimes. The only solution is to legalize the production and plantation of the coca plant. The coca plant and its effects are not as bad as cocaine or crack cocaine. Making the plant legal will help the government control the percentage of the plant that is distributed and how much cocaine is being produced. The government could also tax the sales of the drug. Taxing cocaine could improve Mexicoís economy and solve the issue of smuggling drugs between Mexico and the United States.

Ivory

Chemical Properties

Hydroxylapatite is a mineral that naturally occurs in the bones and teeth of both humans and animals. Hydroxylapatite is a thermally stable compound that starts to disintegrate around 800 - 1200 degrees Celsius. It is an ionic solid, forming a regular pattern of positively charged calcium ions and negatively charged phosphate ions in a hexagonal crystal lattice. The hexagonal crystal lattice structure allows this molecule to form a rigid backbone that supports the other molecules found in ivory. Hydroxylapatite makes up 70% of the entire structure, the other 30% is water and organic molecules including collagens, glycoproteins,

and proteoglycans.

Historical Conflict: European Imperialism in Africa

European contact with Africa began with trade routes along the African coast. Though merchants were usually the ones working and selling on these coastal trading stations, there were also missionaries and explorers looking for new land to develop. It was not until the 19th century that European powers expanded and began the division of Africa. This was fueled by the Industrial Revolution and a need for resources such as trees and minerals. As Imperialism grew stronger and more European countries began to colonize lands for raw materials, the Industrial Revolution exploded. King Leopold II took over the Congo and extracted resources to gain personal wealth. He took control of the ivory trade and forced natives to collect sap to satisfy international demand for rubber. With more and more lands being sectioned off, the more intense the fight for land became. This started the scramble for land in Africa and devastated the future of its inhabitants. It took less than twenty years to partition the land and drastically change the future of the entire continent.

Although Ivory was not the main reason behind the colonization of Africa, it did play an important role. The European powers needed raw materials and invaded the resource rich lands of Africa to get them. Ivory was prized for its unique properties. Ivory is easily carved due to its molecular structure, allowing statuettes, jewelry, combs, and many other useful items to be made from it. As France became interested in Africaís resources, it set up occupation of what is now known as western Sudan. This led to military expeditions near the Ivory Coast in hopes of defeating Samory Toure, the “Black Napoleon of Sudan.” The Ivory Coast can be found between the Gold Coast and Liberia. It earned its name from merchants that recognized it as an abundant source for ivory tusks.

Due to the colonization of lands in Africa and the high demand for exotic resources, ivory became a commodity. The surge for ivory increased poaching and decreased the elephant population. Despite widespread political awareness of the problem, poaching continues to this day. The Kenyan government released information in 2009 that poachers killed 232 elephants, 145 more than in 2008 and 47 more than in 2007. It was also estimated that in 2006, 23,000 elephants were illegally slaughtered so that ivory could be torn from their jaws and sold on the black market. This legacy of poaching and its consequences began with imperialism in Africa.

Contemporary Conflict: Poaching

Poaching is an issue that has devastated several animal species and brought others to the verge of extinction. Elephants are among those that are endangered. The destruction of these majestic animals is due to ivory poaching. Popular demand for ivory and its high value is the reason behind the increasing deaths of elephants. In 1989, a law put in place by the Convention on International Trade in Endangered Species (CITES), banned the national sale and trade of ivory. This ban helped reduce the demand for ivory which somewhat decreased poaching rates. However, this law did not stop poachers from killing elephants and selling their tusks on the black market. In 1977, Africa had a thriving population of 1.3 million elephants, but by 2007 an estimated 600,000 were left, proving that ivory poaching is still at large.

Solution

There are several projects and laws already in place to prevent further poaching of elephants. Amboseli National Park, located in the Rift Valley province in Kenya, is a safe reserve developed to help protect wildlife such as African elephants. The Elephants Research Project (ERP) is involved with this park. It is the largest and longest study of the elephant species in the world. The Elephant Penny Wars (EPW) helps educate and involve high school students about not only elephant poaching but also the poaching of animals in general. This system works by each classroom owning a jar with a different animal that is close to extinction represented on the jar. Each classroom donates the collected coins to various projects that help save different animal species of their choice. A separate jar is placed in a common area specifically associated to saving elephants and all the proceeds go to the ERP. This program will not only educate teenagers on the severity of animal poaching but it will also get them involved.

Mustard Gas

Discovery

Chemists as early as 1822 recorded combining sulfur dichloride and ethylene, but none wrote of the blistering reactions that mustard gas causes. A German chemist named Viktor Meyer living in America developed the most recent and effective solution of mustard gas, but instead of sharing his concoction with the United States, he shipped the formula back to Germany.

Viktor Meyerís recipe for mustard gas included 2-chloroethanol, which reacted with potassium sulfide to produce thiodiglycol. Thiodiglycol was then treated with phosphorous trichloride. These compounds do not occur in nature, and potassium sulfide is extremely rare due to the fact that it easily and irreversibly reacts with water. Since it is a solid, Meyer combined potassium sulfide with 2-chloroethanol, a clear liquid; in order to form thiodiglycol. Thiodiglycol is a pale yellow liquid, and when combined with the final ingredient, phosphorus trichloride, it becomes liquid sulfur mustard. In 1913, Hans Thatcher Clark experimented with mustard gas, replacing the sodium trichloride with hydrochloric acid, producing an effective vesicant that could cause burns to human skin, seep through fabrics, and contaminate areas it touched for days.

In 1993, the Chemical Weapons Convention held by the United Nations outlawed mustard gas. The convention required its production to be declared to the UN. Due to its volatility, the creation of mustard gas is rarely attempted in a lab setting. Even if created, getting it into gaseous form and containing it would be very difficult, not to mention highly illegal.

In a pure form, sulfur mustards are clear liquids. Weapons grade sulfur mustard, the kind produced for chemical warfare, is a yellow color; hence the name mustard. This is because it is less pure, and therefore discolored.

Chemical Properties

Sulfur is a naturally occurring element known for its foul odor and yellow color. However innocent this element sounds, it is a key ingredient in one of the most controversial and dangerous types of chemical weapons, sulfur mustard. More commonly known as mustard gas, sulfur mustard was used for the first time in battle during World War I. In order to develop a weapon from it, the liquid sulfur mustard is forced into pressurized containers to be dropped on enemy soldiers or fired behind enemy lines using a mortar. It creates severe blisters and if inhaled, blisters form in the lungs affecting breathing. Even soldiers wearing gas masks are not safe. Mustard gas can penetrate fabric uniforms, to injure even the most well armored soldiers. Within a day, symptoms of exposure begin to appear. It is both mutagenic and carcinogenic to humans. Being a mutagen, mustard gas changes the DNA of exposed cells. These mutations manifest in long-term adverse health effects such as cancer and immune system deficiencies.

Historical Conflict: World War I

On July 18, 1914, Austria-Hungary declared war on Serbia, starting the first major global conflict in history. World War I (WWI) was the result of growing tension between European nations, that reached its tipping point with the assassination of Archduke Franz Ferdinand of Austria-Hungary. When it ended in 1918, almost the entire world was involved in the war. The world split into two alliances: the Central Powers and the Allied Powers. The Central Powers included Germany, Austria-Hungary and the Ottoman Empire; the Allied Powers included the United States, Britain, Russia and France. Most fighting took place in Europe, in the air, on the land, and at sea. Places like the British coast as well as Germanyís borders were hot zones for battles. Close to 10 million people died because of the war. In the battle of Verdun alone, over a quarter million people died from the war in about ten months. Weapon advances such as the machine gun, submarine, and poison gas revolutionized battle tactics and changed the face of modern warfare.

The molecule that played the most revolutionary role in WWI was sulfur. Sulfur is the basis for the first chemical weapon developed in modern history. Compounds based on sulfur were combined with several other ingredients in order to make mustard gas. These primitive chemical weapons caused intense pain, but their effectiveness as a weapon is often questioned because there were few fatalities from mustard gas alone. Possessing extremely powerful blistering properties, this harsh vesicant was used to incapacitate enemy soldiers without killing them. Mustard gas was released behind enemy lines to cause chaos and widespread devastation of enemy infantry troops. Penetrating through cotton uniforms, not even soldiers armed with gas masks were safe from the painful effects of mustard gas. Although the gas proved to be ineffective, it was still useful for rendering a certain area uninhabitable for days after use. These primitive chemical weapons were too underdeveloped to have contributed to any major victory on either side of the conflict in WWI.

Sulfur mustards were not worth fighting with during WWI. These primitive chemical weapons caused mass suffering but very few deaths or decisive victories. The excruciating pain inflicted by these weapons was not worth their combat effectiveness. Mustard gas burns caused intense pain to those who were exposed to the gas, and often times the doctors and nurses treating the burns would be exposed to it as well. Later in the war, when mustard gas was used as an area denial weapon, it would kill any plant or animal life that occupied the area

it was used on. The negative aspects of using mustard gas far outweighed the benefits. Alternatives, such as the use of more conventional weapons, should have been implemented.

Contemporary Conflict: Chemical Weapons and Terrorism

For the majority of passengers, it was just another ride to work on the Tokyo Subway. For six thousand others, it was a series of events that they would never forget. On March 20, 1995, the morning commute turned into the largest act of domestic terrorism in the history of Japan. On this day, a group of Japanese religious extremists known as Aum Shinrikyo released the deadly nerve gas, sarin, into several subway cars in the Tokyo metro system. Aum Shinrikyo is a religious cult formed in 1984, notorious for the extreme beliefs of itís leader, Shoko Asahara. Asahara published a book about the beliefs of himself and of the cult, where he stated that he was Christ, and that when a nuclear Armageddon befell the world, only those who followed his teachings would be saved. Aum Shinrikyo is also believed to be the culprit behind sarin attacks on a group of Japanese judges that were ruling against the organization in a real estate lawsuit a year prior to the subway attacks. As a statement and demonstration of their power, the organization released the deadly sarin gas, killing several of the judges. After the events on the subway, the Japanese government created new laws regarding ìorganizations with strong influence over their members, a policy clearly directed toward Aum Shinrikyo.

Sarin is a modern chemical weapon that is so powerful a drop the size of a pinhead can kill an adult. Although it is banned by international law, Aum Shinrikyo chemists were able to acquire the necessary materials to create the chemical weapon in an undercover lab. Several Aum members wrapped packets of liquid sarin in newspaper, punctured them on the subway cars with sharpened umbrellas, and exited the cars. As people began to realize that this strange liquid was making them sick, they began to panic, causing mass chaos. The result of these attacks were thirteen deaths, fifty people in critical condition, and over 5000 minor exposures. Sarin gas is made up of a tetrahedral phosphorus along with methylphosphonyl difluoride and a mixture of isopropyl alcohol.

This act of domestic terrorism is similar to World War I because of the weapons used. The sarin attacks on the subway lashed out against the government of Japan, whereas WWI was the result of years of growing tension between entire countries. The 1995 sarin gas attack on the Tokyo subway is related to World War I because of the controversial, unconventional weapons used in both conflicts. The use of chemical weapons is highly discouraged amongst the members of the international community, and there are United Nations laws passed that prohibit their production and use. These two conflicts, although one occurred far after the other, are linked by the use of unconventional weapons of mass destruction.

Nicotine

Discovery

In 1560 the French ambassador to Portugal sent tobacco seeds from Brazil to Paris where nicotine was used for medical purposes. It was named after the tobacco plant *Nicotiana tabacum* and was named by Jean Nicot de Villemain. The Portuguese began to smoke

tobacco and were responsible for bringing tobacco to other countries. They described it as a holy herb and believed it to have healing powers. They believed that it was a remedy sent from God to man. Some Portuguese considered nicotine the opposite, and described it as an evil plant and believed it was an invention of the devil. Portuguese sailors were avid smokers and were responsible for setting up tobacco trades with India, Brazil, Japan, China and Africa. It was chewed, snuffed and even administered rectally in religious ceremonies.

Chemical Properties

Nicotine is a strongly alkaline heterocyclic base that contains a ring of four carbon atoms and one nitrogen atom, called a pyrrole. Nicotine is an alkaloid found in the nightshade family of plants, predominantly in the tobacco plant. Some other plants that contain nicotine are the potato, eggplant, and green pepper, but they have lower quantities. An alkaloid is any group of nitrogenous basic compounds typically found in plants, which are usually insoluble in water and physiologically active. Nicotine in tobacco plants is formed in the roots and stored in the leaves where it is used as an insecticide.

As nicotine enters the body, it is distributed quickly through the bloodstream and can cross the blood-brain barrier. It takes about seven seconds for the nicotine to reach the brain. The atoms that make up nicotine are all important to its physiological activity; but nitrogen is the most essential. Molecules must have a certain shape and contain certain atoms to bind to receptors and induce psychological or psychoactive responses. The nitrogen in nicotine helps it bind to the nicotinic acetylcholine receptor found in the brain, the peripheral nervous system and muscles, and acts as a general stimulant.

Historical Conflict: Slave Trade

During the Civil War there were many slaves that revolted against their owners. Nat Turner and Nathanial Bacon led two of the most successful revolts. Nat Turner began his rebellion in Virginia. He led a small group of slaves that began the rebellion by killing slave owners in the Virginia colony. As the rebellion moved cross-country, eighty slaves eventually joined, but were eventually defeated in Jerusalem, Virginia. Nathaniel Bacon was not a slave but he was against the institution. In 1676 he led approximately six thousand white bond laborers and two thousand black slaves to fight against the tobacco slave plantation owners in Virginia. They drove the Governor of Virginia back to England and shut down all tobacco production for 14 straight months.

Slaves worked on many kinds of plantations, but the most brutal were the tobacco plantations. Since nicotine is addictive, people who used tobacco products wanted more of them, increasing demand and the need for a cheap work force. Tobacco farming requires a large work force because global demand was large and huge quantities of tobacco leaves needed to be cultivated, dried, packaged and shipped. To satisfy this need, slaves were brought to America from Africa and the West Indies. From the 16th century to the 19th century an estimated ten million slaves were brought to America.

Slavery was abolished in 1865 with the passing of the Thirteenth Amendment of the United States Constitution. This made slavery illegal in the United States but it did not solve the problem of institutional racism. The legacy of slavery lived long after the Civil

War/Reconstruction period because of segregation and the Jim Crow laws. Segregation is the act of physically separating two different races; in this case the separation of African Americans and whites in all public facilities. African Americans had to eat at different restaurants, drink from different water fountains and even attend different schools. Segregation was enforced by the Jim Crow laws, which upheld separate but equal laws for African Americans and whites. This meant that African Americans would have the same rights as whites just in different ways. However, this lead to accommodations that were inferior to African Americans.

When these laws were in effect, African Americans were offended by the injustice. These feelings led to the civil rights movement in the 1950's and 60's. During the civil rights movement, African Americans joined together to try and overthrow the Jim Crow laws. In 1954 the Supreme Court ruled that segregation in schools was unconstitutional in Brown vs. Board of Education. The court stated, ìSeparate educational facilities are inherently unequal." This means as long as African Americans and whites are separated they can never be equal. This was the starting point for many other civil rights acts. In the Civil Rights Act of 1964, racial segregation of schools, public facilities and work places was banned in America. It also ended the unequal requirements for African Americans to be able to vote. At the time the only way they could vote was if their grandfather was allowed to vote. The majority did not have sufficient proof of this fact. In the Voting Rights Act of 1965, finally all discriminatory voting practices were outlawed in the United States. This led to the end of the of the Jim Crow laws legacy.

Contemporary Conflict: Tobacco Companies

Tobacco companies are still making money from people that continue to buy cigarettes, even though they have proven to be a health risk. The number of people dying around the world from diseases caused by smoking is 5.4 million and it continues to grow. The biggest tobacco company is Phillip Morris; it produces the largest amount of tobacco around the world. Their cigarettes are sold in 170 countries. In order to get people addicted, tobacco companies like Phillip Morris began to use more nicotine in their cigarettes, but they did not make this public knowledge. In 2009, a jury in Fort Lauderdale, Florida ordered Phillip Morris to pay $300 million to a former smoker who claimed he needed a lung transplant. Phillip Morris also lied under oath about nicotine being an addictive drug. Many people have reported to have lung disease because of smoking and are blaming the tobacco companies for putting too much nicotine in the cigarettes.

The conflict between the government and the tobacco companies connects with slavery because the molecule nicotine is found in tobacco plants. Slaves were forced to work for no money and in horrible conditions. Many slave owners lied about the conditions the slaves worked in so they would not have to change the way they ran things. Although much different from slave owners, tobacco companies likewise use underhanded means of getting people to buy their product. Nicotine causes people to want more of it, so tobacco companies are almost ìforcingî people to buy their cigarettes. The production of tobacco was responsible for the deaths of millions of slaves during the time of the slave trade and smoking is responsible for the deaths of million of people who smoke around the world today.

Oil

Discovery

Oil was discovered about 200 million years ago. Although no one knows the exact date of discovery, oil has been used in various unique ways. The Ancient Greeks used oil to burn their enemiesí ships. They would pour oil into the sea and light it on fire. The American Indians used pitches, which are thick, dark, sticky substances obtained from seeps in the ground, to waterproof canoes and make medicines. American Indians harvested the oil by digging small holes around active seeps and lining them with wood. In China, oil wells were drilled up to 800 feet deep, using only drill bits that were attached to bamboo poles. The Chinese burned the oil to evaporate brine and produce salt. It was not until the 1900's that oil became primarily used in combustion engines.

Chemical Properties

Crude oil is useful because of the hydrocarbons it contains. Oil is created in layers of sand and silt. The heat and pressure from these layers convert the remains of animals and plants into crude oil. Sometimes crude oil is called 'sweet' because low levels of sulfur provide the oil with a sweet taste and enjoyable smell. Oil is classified by the weight of the molecules and is measured in barrels. After the crude oil is removed from the ground, it is sent to a refinery by a pipeline, or it is shipped. The refining process, which is called fractional distillation, separates crude oil based on molecular weight.

Before the oil goes through the distillation process, it has to be converted into gasoline. Crude oil is converted to gasoline by 'cracking' it. Cracking crude oil is the process by which the crude is broken down into heavy heating oil. This process changes the molecular structure, breaking longer molecules into smaller molecules. During fractional distillation, crude oil is heated at different boiling points. Evaporation temperature depends on the length of the carbon chain; shorter chains evaporate more easily than longer ones. The ease of evaporation relates to London forces, weak intermolecular forces responsible for the attraction between hydrophobic molecules such as hydrocarbons. The smaller hydrocarbon chains have less surface area for London forces to occur between molecules and they turn into a gas at a lower temperature. Less energy is required to overcome the weak intermolecular attraction.

Fuel burns in a combustion reaction that produces heat and releases energy. It is a mixture of fuel and an oxidant. The oxidant is often oxygen. Most of today's combustible engines run on gas or diesel. A low grade fuel like coke can be partially burned to make a higher grade fuel like methane and this process is called gasification. The products of a combustion reaction are usually carbon dioxide gas and water vapor

Historical Conflict: Iranian C*oup d'Etat*

The Iranian *coup d'Ètat* of 1953 was caused by arguments over oil rights. The conflict was between the Iranian government and the governments of Great Britain and the United States. Britain gained control of Iran's oil fields during World War II, and did not want to relinquish them. However, in 1951 a nationalist named Mohammed Mossadeq was elected

prime minister of Iran. Mossadeq was committed to having Iran control its own oil. In 1953, Britain decided to get help from the American Central Intelligence Agency, by creating a coup to overthrow the Iranian prime minister. It was called Operation Ajax, and it was a success. The Shah, Mohammad Reva Pahlavi, established good relationships with the Western world after the coup. Some Iranian politicians were upset over this, because they were worried that the Shah was controlled by the United States and Britain and that the Western world would try to usurp its oil resources. In 1979, the Shah was overthrown in an Islamic Revolution led by the Ayatollah Khomeini.

Britain's involvement in Iranian oil has its origins in World War II. The Allies were sending troops to Iran because they wanted to reduce the German influence there. The Allies feared that Nazi spies in Iran wanted to harm British-owned oil facilities. The Shah of Iran, Reza Khan, refused to get rid of the Nazis so the Allies sent troops to Iran to replace him with his son, Mohammed Reza Pahlavi. They wanted to ensure Allied supply lines for the Soviets fighting against the Axis forces on the eastern front and maintain their oil concessions with the Iranian government. The largest concession was held by Great Britain and was called the Anglo-Iranian Oil Company. It was a bad deal for Iran because it received fixed oil revenues, even as the price soared, and because Iran did not have the right to inspect the company's accounting. This situation is what led to a brief period of nationalized oil during the time of Mosaddeq, followed by the coup to overthrow him. After World War II however, Mohammed Reza Pahlavi granted companies like British Petroleum oil rights in Iran.

The American involvement in the *coup d'Ètat* of 1953 had unforeseen consequences. These consequences include, the Iranian Revolution, the American Hostage Crisis, and the present conflict involving nuclear weapons. The Iranian Revolution was a chain of events in Iran that involved the takeover of Iran's monarchy under Shah Mohammed Reza Pahlavi. He was considered too friendly to the West and was violently overthrown in a revolution led by Ayatollah Khomeini in 1979. The American Hostage Crisis was a diplomatic crisis between Iran and the United States. Islamic students took over the United States embassy to support the Iranian Revolution and protest the Americans allowing the Shah to seek medical treatment in the United States. Some hostages escaped and others were released. Currently the United States and its allies suspect Iran is trying to enrich uranium for a nuclear weapon, which breaches the Nuclear Nonproliferation Treaty. It states, "no country can have nuclear weapons and the countries that do have them can't use them against other countries." Iran denies making nuclear weapons; they claim that they are making nuclear power plants for energy production.

Contemporary Conflict: Niger Delta

In 1958, oil spills started to occur in the Niger Delta because of a series of attacks and sabotage. Explosions within the pipes were damaging the environment, and burning nearby wildlife. The pollution effected Nigeriansí health and the environment. Oil companies, such as Shell, controlled many of these pipes. They were responsible for over three thousand oil spills in the last fifty years. Shell, however, claims that ninety-eight percent of the leaks and spills are the result of sabotage for the purpose of people claiming cash compensation. Shell claims that thieves drilled holes in the pipelines and sometimes cut the pipes with hacksaws to siphon the oil and sell it for themselves. In response to the presence of foreign oil companies, certain groups like the Movement for the Emancipation of the Niger Delta (MEND), are

kidnapping and killing foreign workers. The oil wars began when MEND was fighting with the Nigerian government and the oil companies because they wanted more money from the oil installations.

Solution

Nigeria needs an environmental solution because pollution is destroying its trees, plants, animals, people, and land. The United Nations can help this problem by giving some money to the government and oil companies of Nigeria. The money can help repair damage to the environment. The Natural Resources Defense Council (NRDC) can help donate money to Nigeria as well, to repair the damages.

Opium

Discovery

Ancient Sumerians discovered opium in 4000 BCE in Mesopotamia (modern-day Iraq). The drug morphine is derived from the opium poppy. It was used throughout Europe for pain relief during wars and surgical operations; however, people wanted it to be more effective and more potent. In 1805, a German pharmacist named Freidrich Wilhelm Adam Serturner ran multiple tests on the opium poppy, experimenting with its analgesic effects. Serturner discovered that concentrating the opium extract created a drug ten times stronger than regular opium alone. Serturner called the drug morphine, named after the Greek god of dreams ìMorpheus.î The use of morphine reached its peak when the first reliable syringes were developed in the 1850's. Today, morphine is used daily in hospitals and medical centers and plays an important role in the medical field.

Chemical Properties

Morphine is an analgesic. An analgesic is a compound that causes sleep and fatigue. Morphine is a type of benzylisoquinoline alkaloid, which is synthesized in *Papauver somniferum* and other poppy species. Morphine provides quick pain relief, and if used in excess, hallucination. Opium binds to opioid receptors in the central and peripheral nervous systems. In order for the morphine to bind the opioid receptor in the central nervous system, it must pass the blood-brain barrier. However, morphine passes through the blood-brain barrier with difficulty because of its polar nature. Morphine binds to the opioid receptor relieving pain and also causing drowsiness and numbness. However, taking too much morphine can damage the body. Overdosing can cause mental issues and fatigue and it also affects the cardiovascular system, respiratory system, muscle structure and blood pressure. When used correctly, it relieves pain

Historical Conflict: Opium Wars

Opium is a very powerful painkiller and helps a lot of people with pain, but there have been times where people who misused it were affected terribly. In the 1770's China and Great Britain became allies and established a trading contract with one another. Things were going smoothly until 1830, when Britain began illegally trafficking opium throughout China. At the

time, China was under the Qing dynasty lead by Huang Taji. The British wanted to continue their trade to make a profit, but the Chinese government wanted to eradicate opium for the sake of their economy and citizens' well-being. China demanded that the British stop trading opium, but Britain refused. In 1839, China requested that Lin Tse-Hsu, the commissioner of Canton, destroy all the opium in China. When Lin's removal of the opium succeeded, the British reacted to the destruction of opium by launching an attack.

China was eventually defeated in 1842, and the British colonized China by 1860. China was forced to sign a treaty agreeing to allow the trade of opium without revolt. This lasted for over a century until the Chinese Communist Revolution in 1949.

The opium trade caused the war between Britain and China in 1840 and left China in devastation and ruin. Over a million Chinese opium addicts died. The addicts were usually aristocrats who had a lot of money, which they used to buy large amounts of opium. Originally opium was under doctor control and used as a painkiller, but once it became widely available many people abused it and eventually died. Previously China was a prosperous and rich land, but the aristocrats compromised China's beauty. The streets were filled with smoke, people were killing each other for opium, and the economy was undermined by illicit opium sales rather than supported through legal industries or taxes.

Later streets were filled with homeless beggars who had lost everything. Britain thought it could keep selling opium and raise profits, but China had a problem with its citizens abusing the drug. China complained about this to Britain and asked for them to stop the distribution of opium, but Britain refused. This tension between them eventually started the Opium War.

The Opium War led to colonization, homicide, and injustice for the Chinese. Many lives were lost, and while the British profited from the opium trade, the Chinese suffered for over a century. Britain established its own law and overruled the Chinese government. British citizens in China were not obligated to follow any Chinese laws. Britain's greed was the downfall of China and other countries colonized by Britain. While Britain was colonizing China, opium production was increased tenfold. It is a drug that takes the will of a country and its people, leading to endless suffering.

Contemporary Conflict: Afghanistan

In 1979, the Soviet Union invaded Afghanistan. In response, a group of Afghan guerrilla fighters called the Mujahideen, fought the Soviets for ten years and defeated them in 1989. Shortly thereafter, civil wars between different tribes broke out. The Afghan government became corrupt, and warlords rose to power. These warlords traded opium to acquire funding for weapons. With the help of the Pakistani Intelligence Service, thirty Islamic students led by Mullah Omar created a religious fighting force called the Taliban. The Taliban took over the province of Kandahar from one of the warlords, and later put an end to the civil war. Eventually, the Taliban used an extreme interpretation of Sharia, or Islamic law, to become religious dictators. They enforced strict Islamic order and as a result, banned all trade of opium, or opium production. However, after the 9/11 attacks in 2001, the United States bombed Afghanistan looking for Osama Bin Ladin, the leader of the terrorist group Al Qaeda. The Taliban formed a resistance and took action to remove all foreign powers, and resumed opium trade to fund their campaigns against US soldiers. Opium production in Afghanistan

has been at its highest peak since 2006. One consequence to vast opium production is that warlords are back in power. The US feels that eradicating opium would limit the Taliban's funding and decrease its power.

Opium is a destructive drug that controls a country and its people. The relationship between the opium wars in China and Afghanistan is that opium started and fueled both wars. Opium is a valuable crop both politically and economically. Economically, it is medically valuable for extracting analgesics such as morphine and making narcotics such as heroin. A country that mass produces opium most likely relies financially on the product. Politically, it is valuable in Afghanistan because its manufacture gives power and prestige to whoever controls it. When the trade expands over the entire country, controlling factions soon overpower the country's government by treaty or rebellion. In both conflicts, opium has brought destruction to the country and harm to its people. The British overthrew the Chinese government, and the Taliban took control over the Afghan government. In both China and Afghanistan, the controlling governments became corrupt. What separates these conflicts is the stance of the foreign powers. The British used opium to gain wealth and power and to colonize China, whereas the US is fighting to end the Taliban's reign and help the people of Afghanistan.

Today, the debate is whether to eradicate the opium in Afghanistan or to leave it. Some say that eradicating opium will only anger Afghan citizens and the opium trade should be left alone. However, if opium is left alone, the Taliban will continue its rise to power. Currently the Americans are assisting the people of Afghanistan and its government by eradicating opium.

Solution

In order to end the war in Afghanistan, the US must eradicate all opium throughout Afghanistan. Since the Taliban's funding for weapons comes from the opium trade, eradication of opium would be very effective. The downside to this strategy is that poor farmers make money from opium and half of Afghanistan's economy benefits from the opium trade. The United Nations could provide support by using non-profit organizations such as UNICEF to raise money and provide aid such as medical support and food and water supplies for poor Afghans. In order to execute the eradication plan, the Afghan government must find another gross domestic product to substitute for opium to support their economy. The farmers could find another agricultural product to harvest and trade, such as rice or wheat. Recent findings have shown that valuable metals and minerals are located in Afghanistan. Mining these natural resources could support the economy. Despite the issues with the economy and the farmers, Afghanistan's biggest problem is the Taliban's continuous rise to power. Eradicating opium is the most rational solution.

Penicillin

Discovery

John Tyndall, a British physicist, accidentally discovered penicillin when he experimented with bacteria. He was testing to see if the bacteria in the air were equally dispersed. Tyndall set up one hundred test tubes around his laboratory and left them open for

bacteria from the atmosphere to fall in. The test tubes collected bacteria, and also some mold, which appeared to fight off the bacteria.

Alexander Flemming rediscovered penicillin nearly thirty years later in 1928, also by accident. While working at St. Mary's Hospital, he was studying different types of molds and bacteria with petri dishes and chicken broth. One of his open petri dishes of bacteria became contaminated with mold from the hospital. The mold appeared to be killing the bacteria and created a "glowing halo of light" around the mold colonies. The mold produced penicillin, which was killing the bacteria. Flemming realized he had found a potential cure for bacterial infections. Flemming made his discoveries known to the public, and went to the government asking for grants to develop a therapy. Unfortunately, this was during the Depression, and the British government did not have the money to fund his project.

During World War II (WWII), Howard Florey was appointed Honorary Consultant in pathology to the army. In 1938 alongside Ernst Boris Chain, Florey conducted an investigation into the properties of natural antibacterials. They were aware of Flemingís discovery and decided to isolate the active substance in the penicillin mold. Funded by the Rockefeller Foundation, Chain and Florey led a team of British scientists in 1939, whose efforts led to the production of pure penicillin. In 1940, a report was published which described how penicillin had been found to be "a chemotherapeutic substance capable of killing sensitive germs in a human body." Afterwards, the government assisted and enabled the mass production of penicillin which was used extensively during WWII.

Chemical Properties

The active component in penicillin is the beta lactam ring, composed of three carbons and a nitrogen atom. The beta lactam ring is effective because its bonds are at 90-degree angles, which is not a preferred bond angle. It causes the ring to be stressed at the atomic level. When the bacterium wishes to build a new cell wall during mitosis, it releases enzymes, which bind to the penicillin molecule causing the ring to open relieving the stress. This deactivates the cell wall forming enzymes and stops the bacteria from being able to hold the cell wall together and ultimately kills the cell.

Historical Conflict: World War II

World War II lasted between 1939-1945 and was the largest war in history. It is important for the history of penicillin because during the war the use of penicillin was perfected. Almost fifty million soldiers and civilians died, about twice the number of causalities in World War I (WWI). The two sides of WWII were the Allies and the Axis. The Allies included the United States, Great Britain, Russia, China, and France. The leading countries on the Axis side were Germany, Japan, Italy, Romania, and Hungary. The war started when Germany was treated unfairly in the Treaty of Versailles. The Treaty stated that Germany could not have an army and would have to pay for all costs of WWI. About twenty years later in 1938, a small political party called the National Socialist German Workers' Party (NSDAP or Nazi) slowly started to gain power. Adolf Hitler was the leader and he was legally appointed chancellor in 1933. Hitler then declared himself dictator of Germany, making the Nazi party the ruling political power. Hitler violated the Treaty by invading other countries, starting with Czechoslovakia and Poland. Even though WWII is known as one of the biggest tragedies in

human history, it also came with some great medical advances, such as the discovery and perfection of penicillin.

Penicillin played a key role during WWII; without it, many wounded soldiers would have died from infections. It reduced the number of deaths that would have otherwise occurred by 12-15%. Even though European scientists discovered penicillin, the United States had it first for use because they funded the research. It was quickly made, and could be produced in mass quantities very cheaply. Near the end of WWII, most countries were creating their own penicillin plants and administering it to their wounded soldiers.

On the battlefield, penicillin prevented many thousands of war deaths from gas gangrene, bacteria, and other infections. Penicillin earned the names ìmiracle drugî and ìmagic bulletî because of how quickly it was able to act. The war provided the necessary political motivation to fund research into penicillin. It is still used today, about 9 million grams of penicillin are prescribed everyday around the globe. Even without WWII, penicillin would have undoubtedly been discovered. However, it was extremely convenient for penicillin to be discovered when the world needed it in a time of war.

Contemporary Conflict: Superbugs

Since the dawn of time there has been a constant war against bacteria. With the continued stream of new and powerful antibacterial medicines being released, it seemed as if the human race had the bacteria situation under control. Unfortunately, these antibacterials have proved to be our downfall. Anyone who has ever used antibiotics for other purposes than those they are intended for has helped fuel this rise in antibacterial resistant bugs. There are many ways to overuse antibiotics; they range from using antibacterials for viral infections to farmers feeding antibacterials to their animals to speed up their growth. The increase of antibacterial abuse has caused mutations in bacteria, causing them to evolve into antibacterial resistant strains, or superbugs. The first bacterium resistant to penicillin was discovered in 1948. Superbugs have now become resistant to all antibiotics, and are killing hundreds of people.

During WWII, soldiers were dying from bullet wounds that were becoming infected with different bacteria in the air. In 1941, penicillin reached a state where it could be mass-produced cheaply, while still being highly effective. Since 1928, bacteria were at the mercy of penicillin, and those bacteria that threatened the life of hundreds of soldiers were easily destroyed. Currently in the United States, more people annually die from superbugs than AIDS.

Solution

In order to stop the spread of superbugs, public education is needed so that citizens make wiser choices regarding the use of antibiotics. Creation of laws that would stop the use of antibiotics, and devote more money to researching new cures to fight drug resistant strains, would also be effective solutions to this problem.

Educating the public about antibiotics should have been done sixty years ago when they first became widespread; however it is not too late to make up for the past. By having

informative PSAs on television, brochures in hospital waiting rooms, and presentations put on by health clinics, the word would spread and lead to better choices regarding antibiotic use.

Two laws should be created to help reduce the rise of superbugs. These laws would pertain to doctors and farmers. A law should be created that requires doctors to inform their patients about the use and affects of over using antibiotics. This would provide the knowledge needed to make educated decisions about antibiotic use. The second law would target farmers who use antibiotics in feed for their cattle to stimulate growth. Antibiotics could be used on animals if they have an infection, but should not be abused by using them as growth stimulants. These two laws will help educate the public, and stop farmers from abusing antibiotics, thus reducing the creation of superbugs. If these acts happen, resistant bacteria will mutate back to antibiotic susceptible versions.

Progestin

Discovery

Many scientific advancements contributed to an effective form of oral contraceptive. In the 1930's, scientists from New York focused their research on the female reproductive system. It was a goal of Margaret Sanger, a birth control advocate, and her followers, to create a pill that a woman could take to prevent pregnancy. The first pill was derived from hormones straight from a woman's body, and although it seemed to do its job, it had too high a mortality rate to consider marketing.

Progestin, a synthetic substitute for progesterone, does not occur naturally and was made in 1940 by a scientist by the name of Russell Earl Marker. Marker went to study in Mexico's hormone industry, and found a chemical in Mexican yams called diosgenin (a steroid found in plants, mostly yams) that could be turned into progestin. The process that turns this natural hormone into progestin became known as Marker Degradation.

Chemical Properties

The birth control pill consists of progestin and estrogen, and it alters a woman's ovulation cycle. The two natural hormones that control the menstruation cycle are progesterone and estrogen. Progesterone is responsible for the release of an egg during ovulation and prepares the body for pregnancy. Estrogen prepares the ovaries for ovulation. When an egg is released from the ovaries, estrogen levels decrease and the body goes through menstruation.

Progestin is a synthetic compound that is based off of progesterone. During the Luteal phase, usually occurring on the sixteenth day of a woman's cycle, progesterone levels increase to help get the uterine lining ready for an egg. Progesterone is too unstable for women to consume every day because substantially changing progesterone levels would damage the ovaries. So in order to lower the intensity of progesterone, a chemical called progestin was created.

Progestin activates the pituitary gland in the brain, which signals the uterus to line its walls with more mucus so the sperm has a harder time entering. During menstruation, a

period of four to ten days, progestin levels are low. Following menstruation, throughout the follicular phase, progestin levels increase significantly. This is when the uterus is lined with mucus. For the remainder of the ovulation cycle, progestin levels stay steady. This lowers progesterone levels because with high levels of progestin, progesterone is not needed. Also, it triggers the pituitary gland in the brain to signal the ovaries to release an egg. Meanwhile, the estrogen portion of the pill has already told the ovaries to mature in the absence of an egg.

Estrogen is the hormone that regulates the menstrual cycle, and is responsible for a women's period every month. When taken in pill form, it reacts with the body to cause an efficient form of birth control. When an increase of estrogen is provided in the reproductive cycle, it tricks the body into thinking that it has released an egg for the fertilization cycle, but it has not. And if there is no egg, pregnancy cannot occur.

Historical Conflict: Early Birth Control

The desire to control the reproductive system has been around for thousands of years. In ancient society, Egyptians developed condoms and the Chinese tried herbal methods of contraception. In contemporary society, birth control pills and condoms are used, but they are a major source of social conflict and sometimes legal dispute. The initial birth control movement started in the late 19th century and led to a national dispute over legalization. In the United States, the Comstock Act of 1873 restricted the purchase of contraceptives and prohibited the dissemination of information about contraception. This brought forward the advocates for the legalization of birth control. Female activists, like Margaret Sanger, were strongly opposed to the Comstock Act and fought against it. This led to a huge movement allowing women access to birth control. This was very important at the time because the movement happened about the same time as World War I. Women could not afford to be pregnant and take care of their children while the men were at war. When birth control finally became legal, Sanger still wanted to create a pill. Sanger endorsed the discovery of the first oral contraceptive created by Frank Colton which Carl Djerassi would later perfect.

When the birth control pill was first introduced to the public it was met with harsh skepticism. For many, the production of a chemical that prevents pregnancy was enough for people to become supporters of the pill, but others were more hesitant. Women who would be taking the pill questioned its safety and availability. On one hand, religious people were afraid that it might promote promiscuous sex. Conservatives and religious citizens, like Catholics, believe that women should not be allowed to use birth control. In their opinion, if a woman has sex, she needs to be prepared to care for a child. On the other hand, those who supported the legalization of contraceptives included liberals, feminists like Margaret Sanger, and her many followers. They believed that women had a right to control their own bodies.

Contraception and information about sexual health should never have been withheld from anyone. A couple may be sexually active, but not be prepared to care for a child. They should not have to abstain from sex just because the law restricts them from buying contraceptives. It is unfair to tell a woman she has to have a baby because it is against the law for her to try and prevent a pregnancy.

Contemporary Conflict: Teen Pregnancy

Teen access to birth control is a controversial issue. The Food and Drug Administration sets age restrictions on the prescription of contraceptive pills to minors. However, many people, including teens, consider access to contraception a matter of teen rights. Conservative families disagree with teens having access to birth control. They do not promote sex outside marriage, and wish to limit the number of teens engaging in sexual activity. Some believe that if teens have no access to contraception, they will stop having sex altogether. Liberals believe that teens should have access to contraceptives without parental consent. They think that teens will not abstain from sex, and therefore it is important for them to have proper protection. This has created a heated debate over teenís safety and rights.

Since the concept of birth control has become world renowned, the debate has applied to younger and younger generations. The initial birth control movement was an issue of womenís rights. Today it is a right that teens feel they deserve. Unprotected sexual activity leads to many unwanted pregnancies. Instead of having to face an abortion, birth control can prevent a teenage girl from getting pregnant in the first place.

Solution

The options that pregnant teens have are very limited in our society. One option is to follow through with the pregnancy and have the baby. Raising a baby is no easy task, and teen moms can use all help they can get. It is very important to support teen moms, and an easy way to do that is for the public to support a runaway teen shelter, or an organization that supports teen moms until they can get back on their feet. My partner and I decided to make silicon bracelets that promote birth control and sell them. We will donate the proceeds to Bridgeway Homes, a runaway teen mom shelter located in Lakewood, CO. This is our way of contributing to the issue at hand. Since this is a very controversial issue it is not talked about often. By spreading awareness with our bracelets we hope people gain a better understanding of how teen pregnancy affects girls.

Rubber

Discovery

In 500 BCE, ancient South American people harvested latex from a plant named *Castilla elastica* and the sap from vines of *Ipomoea alba* (morning glory vine). This combination was used to create rubber objects and tools, such as elastic rubber balls, rubber collectibles, and other rubber artifacts. This discovery of rubber and its functions led to the rise of the Mesoamerican ball game, a central ritual in all ancient Mesoamerican societies. In order for the ball to achieve maximum bounciness, the natives mixed the morning glory sap and Castilla latex to form a rubber sphere-like structure. The rubber ball game was considered the first organized sport in the history of the human race. The ball was kept in play by bouncing off walls and playersí bodies, and was tossed through stone rings to score.

Chemical Properties of Isoprene

Isoprene is a term for the chemical compound 2-methylbuta-1, 3-diene. It is the main component of rubber, and comes from the native Para rubber tree located in tropical South

America. Cuts in the bark yield a yellow or white latex that is collected and distributed. Rubber is an elastic hydrocarbon polymer of isoprene, recognized as latex. Other plants that contain rubber are: euphorbias, dandelions, and figs. Rubber is also known as an elastomer, meaning it is capable of retaining its original form after having lost its shape. In order for rubber to be called an elastomer it has to have a high molecular weight and a bendable polymer chain. A polymer chain is composed of structural units connected by covalent chemical bonds. Rubber polymer is composed of long strands of isoprene molecules called polyisoprene. Each polyisoprene strand contains thousands of millions of isoprene monomers.

Another important chemical process rubber goes through is called vulcanization. It was discovered when a blend of rubber, white lead, and sulphur were dropped on a hot stove. When scientists removed the material, it was no longer affected by temperature. Regardless of stretching, it always brought itself back to its original shape. Sulfur makes the rubber stable, therefore making it easy to use and process. When the polyisoprene strands are heated with sulfur and lead oxide, it makes the sulfur atoms attack the double bonds in the polyisoprene strands and bind to the carbon atoms. The sulfur atoms form individual disulfide bonds linking polyisoprene strands to form a web like structure in the rubber. This procedure of vulcanization made it possible to use rubber in raincoats, overshoes, and in other products, such as tires.

Historical Conflict: Belgian Congo

The Belgians and the Congolese fought over the Congo's natural rubber in the late 19th and early 20th century. These two countries fought over the Congo's natural rubber plant in order to sell it to other countries for millions of francs. Belgium's actions are an example of Imperialism - the takeover of a country or territory by a stronger nation with the intent of dominating the political, economic, and social life of the people. Since the Congo was such a poor, powerless nation, the Belgians easily overpowered them, forcing them into intense labor, working continuous hours collecting rubber sap. If the Congolese disobeyed, they were often killed or dismembered. If this happened, most men were to face what they called the "chicotte." This was a deadly whip made up of sun-dried hippopotamus hide with razor-sharp edges. Punishment involved 100 lashes from the chicotte, done by a Belgian soldier. Tragically, this resulted in a fatal death. Leopold never stepped foot inside the Congo but is responsible for thousands of deaths.

Rubber was one of the main sources of conflict between Belgium and the Congo. It was an economically valuable product, because of increased demand brought by industrialization in the late 19th century. The inventions of the inflatable bicycle tire, followed by the automobile tire, are two examples of new products that were mass produced and needed a source of rubber. Large industries rushed to establish their own rubber plantations. Unlike most rulers at the time, King Leopold II quickly seized the opportunity of controlling his own rubber plantation. Leopold was able to obtain the rain forest near the Congo and harvest miles of Para trees and wild rubber vines. The Congo, a territory of 905,563 square miles, essentially became his personal territory. Though Leopold was in direct control of the Congo, he eventually was unable to pay the costs of his vast rubber plantation because of federal taxes.

Belgium utilized various strategies and tactics to colonize the Congo and exploit its natural resources. Currently, coercive tactics are still being used in the Congo, and the Congo is left with many issues including political and economic instability. During the late 19th century, 90% of Africa was under imperial rule, creating a ripple effect that has left many African natives in poverty and lacking an education. The Congo does not have the power to overthrow the rebel militia groups, and the resources that are being stolen are not benefiting the Congolese. Instead, money from the illegally sold resources is being used to purchase drugs, fire arms, and transportation. The greed for Africaís resources fuels an endless war causing even more bloodshed.

Chemical Properties of Tantalum

Tantalum is one of the few metals on earth that is very unreactive. At room temperature, it reacts only with fluorine, the most active element on the periodic table. At high temperatures, tantalum becomes more reactive to other elements. Above 300 degrees Fahrenheit it reacts with many alkalis and acids. It has a melting point of 5,425 degrees Fahrenheit and a boiling point of 9,804 degrees Fahrenheit. It has the 3rd highest melting point of any element. Tantalum can be found in minerals of columbite, tantalite, and microlite. Most of the tantalum on Earth is found in the Congo, Australia, Germany, Thailand, and Brazil.

Tantalum is a very important mineral used in many electronics, ranging from light bulbs to cell phones. It is also used as the main component in capacitors. A capacitor is a small metal device that is capable of holding energy and releasing it out in a fast bolt. A capacitor is made up of three components; an anode, a cathode and a dielectric. Tantalum pentoxide is what makes up the dielectric. It is between the anode and cathode, and does not conduct electricity. The anode is a positively charged plate and the cathode is a negatively charged plate. The cathode is made of a magnesium dioxide. The anode is made up of a pure tantalum powder. As more energy flows through the capacitor, the stored charge increases. Capacitors are used in the vast majority of commonly used electronics.

Contemporary Conflict: Coltan and Tantalum

The Democratic Republic of the Congo, Uganda, Burundi and Rwanda are fighting over a black metallic ore called coltan, which is found in the Congo. Coltan contains an extremely valuable element, tantalum, used in the most recent technology, like laptops, iPods, and cell phones. Because of the valuable nature of tantalum, surrounding countries want to mine it for profit. Large quantities of Rwandan miners have been caught smuggling coltan ore out of the Congo. The neighboring countries sell the stolen coltan ore to Europe and America, which caused a war in the Congo, in 1996.

This is not the first time the Congo has been exploited. Back in the late 19th century King Leopold of Belgium found that the Congo had a valuable resource just like tantalum. This resource was from the native Para tree, which contained natural rubber sap. The Congolese natives were forced to collect the sap from the Para tree, by the Kings army, the Force Publique. If the Congolese natives were unable to collect their quota of rubber for that day, Leopoldís men would take their wifeís children and rape them. Leopold even went as far as cutting off the workers hands and murdering the natives. Unfortunately, history is repeating

itself. The Congo is once again being taken advantage of, and innocent lives are being taken. There were an estimated 3 million deaths in the Congo massacre lead by King Leopold, and there have been 2.5 million deaths over tantalum so far.

Solution

The blood diamond problem in Sierra Leone is similar to whatís happening with tantalum in the Congo, but the proposed solution for blood diamonds will not work in the Congo. Blood diamonds are mined in African war zones and sold illegally to finance local rebel militia groups. The proposed solution by the United Nations was to create a certification program that cut off export and import routes of the diamonds. The certification program would not work for the tantalum crisis, because the Congolese government does not have the economic or political strength to take care of this on their own.

A solution to help solve the tantalum crisis is to limit the number of electronics being purchased. If the number of electronics being purchased significantly decreases, it will reduce demand for tantalum, which would result in less slave labor and limit the deaths occurring in the coltan mines. Currently 80% of the worldís tantalum comes from Africa and once it is mined, it is virtually impossible to trace the origins of where it is from. An estimated 6.9 million people have died since 1996 and the number is continuing to climb. This issue needs to be recognized and ended immediately; you can help stop this, by limiting the amount of unnecessary electronic devices you purchase.

Sugar

Discovery

Sugar was first discovered in New Guinea in 600 BCE. Natives chewed on sugarcane and tasted the sweet juice inside the pulp. At the time, the natives did not know how to extract sugar, so it stayed relatively unimportant in their culture. The natives later discovered how to turn sugarcane juice into sugar crystals, which were easier to store and transport. Buddhist monks took sugar, and knowledge of the extraction process, back to China. It quickly became a valuable trading item because so many people started using it cooking and baking.

In 1874, Dutch chemist Jacobus vanít Hoff published his findings on sugar. He believed that in molecules where a central carbon atom is bonded to four different atoms, the molecule could exist in a form of stereoisomer. Stereoisomers are molecules that have the same chemical formula, but differ in their three-dimensional orientations of atoms. He also discovered that the two forms of stereoisomer would be mirror images of each other. A German chemist named Emil Fischer discovered the chemical structure of glucose between 1882 and 1902. He discovered that glucose could exist as sixteen possible stereoisomers each with six carbons, twelve hydrogens and six oxygens.

Chemical Properties

Plants use energy from the sun to create sugar in a process called photosynthesis. This sugar is glucose, and plants use it to provide energy for survival. Photosynthesis occurs within the leaves of a plant. It requires water, carbon dioxide and sunlight. Plants have tiny pores in

their leaves called stomata. This is where oxygen is released and carbon dioxide is collected. Water is collected in the roots of the plant and then transported to the leaves through the vascular system. A green pigment in plant cells called chlorophyll, collects sunlight. Photosynthesis takes place in a stage called the light reaction. The light reaction occurs when sunlight is converted to energy in the form of glucose.

Carbohydrates are organic compounds that consist of sugar monomers and are the main source of energy for living organisms. When humans consume glucose and oxygen, the sugar is broken down resulting in the products, carbon dioxide, water and energy. All carbohydrates are created from units of sugar or saccharide. When a carbohydrate consists of only one type of sugar, it is called a monosaccharide, and when it consists of two types of sugar bonded together, it is called a disaccharide. Both are considered simple sugars. The most common monosaccharides are glucose and fructose, which have the same chemical formula and only differ in their chemical structure. When humans digest sugar, our intestines absorb the glucose and transfer it to the bloodstream. Cells then collect the glucose from the bloodstream and break it down into energy to give the body throughout the day. If there is excess glucose in the body, it is stored in the liver and muscles as glycogen. Glycogen is long chains of glucose monomers. When glucose breaks down, the energy in the bonds is used to create adenosine triphosphate (ATP). ATP is a nucleotide that occurs in the tissues and is the source of energy for cellular processes. ATP has three phosphate groups in it, and the bonds between the phosphate groups contain energy that the body uses to function. ATP is used in almost every cellular action involved in movement, growth and metabolism.

Historical Conflict: Slave Trade

Sugar is related to slavery because slaves were extensively used on sugar plantations. The African slave trade began in the mid 15th century when the Europeans needed a cheap work force for their plantations and homes. Many Africans were willing to work in the New World, thinking they would be able to create a better life for themselves. Instead, the Africans found themselves in hostile situations where they were beaten, raped, kidnapped, tortured and killed. The slave trade started with a few thousand slaves but quickly led to millions of Africans being enslaved. This lasted over four hundred years and almost twelve million slaves were taken from their homes and families. The slaves were exported from Africa via the triangular trade, which was a term used to describe the slave routes. The routes linked Europe, Africa and the Caribbean. Sugar plantations were used during this time to make rum. Rum is made from molasses, which is 50% sugar. Because rum was very valuable, the sugar plantations became very important to the Europeans. Once the money was collected from the Caribbean, the Europeans would start the process all over again, using the money to buy more slaves.

Glucose played an immense role in the slave trade because it is the main molecule in sugar. The Europeans believed that the value of sugar was more important and valuable than the lives of the Africans. Sugar plantations were extremely profitable for owners in the Caribbean as well as the governments in Europe. The Europeans used the black slaves as labor instead of Europeans because of racist attitudes and because they were cheaper. At first, only a few plantations were spread throughout the Caribbean, but as time passed almost every island in the Caribbean was claimed by Europeans and had some sort of plantation. In the Dominican Republic 75% of all land was covered in sugar plantations. In the 18th century,

sugar became the single largest English and French import making sugar production very important to all Europeans. Although sugar was grown in Spain and Portugal, sugar production thrived in the Caribbean, requiring more slaves. If sugar plantations had stayed in Europe, the African slave trade would not have been as dreadful as it was.

Although sugar was important, it was never worth creating such a horrible situation for the Africans. The Europeans only cared about making money and they did not consider the consequences. Creating sugar plantations in the Caribbean only caused problems in the lives of Africans and created hatred toward the Europeans. Although sugar production helped the New World develop and expand by sending Europeans to create colonies, it also destroyed thousands of African lives. Even when slavery was abolished, the long-term consequences of slavery remain and still affect countries today. For example in Haiti, sugar plantations were widespread and there were thousands of slaves working on the plantations. In 1804 Haiti declared independence after beating the French army sent by Napolean. In 1825 France demanded that Haiti compensate them for the loss of men and slave colony, and in exchange for 150 million francs, France would recognize Haiti as their own country. It took Haiti close to one hundred years to pay off their debt to France and thus became the poorest country in the western hemisphere.

Contemporary Conflict: Child Labor

Child labor is one of the world's biggest problems, but it is not always recognized as such. It affects over 158 million children every day, and six of those die daily. This totals about 22,000 child laborer deaths per year. Most child workers are kidnapped from their homes, never to see their families again. Child labor occurs most commonly in South America and Africa where people and economies are poor, and families are in need of work. Instead of going to school and receiving an education, children are forced to work for an average of forty cents a day to help support their families. The most common place to find underage workers is on sugar plantations. This is because sugar is an extremely dangerous and laborious crop that requires a lot of strength and manpower to harvest. It demands children to use large knives and machetes to cut the sugarcane when it is harvested. Sugar plantation owners need cheap workers and children make the perfect candidates.

Glucose is a significant factor in the global child labor conflict because harvesting sugarcane is a very time consuming process, keeping children in the sun for ten hours at a time doing hard labor. More and more sugar plantations are continuing to hire children, and it is estimated that there are as many as 30,000 children under the age of eighteen working on sugar plantations in El Salvador alone.

Solution

Child labor is a horrible act that has stolen millions of childhoods. The children in this world deserve a life where they can have an education and a family, as opposed to hard labor and slave treatment. There are already many organizations like UNICEF and the Human Rights Group that are working toward the eradication of child labor, but there is even more that people can do. Manufacturers that use child labor are hard to expose, so there should be a call to challenge journalists. The challenge would include having journalists research and travel the world to try to uncover manufacturers that exploit child labor. Whichever journalist had

the best story of exposing and shutting down the production of child made products would receive a reward and international recognition for their achievements. Their story would also be translated and put into newspapers around the world, as well as a one month feature on the United Nations website under the UNICEF section. This kind of event would be able to promote journalists and activists to go uncover the truth as well as giving them incentive to be internationally recognized.

Nitrates

Discovery

Trinitrotoluene (TNT) is an intense explosive discovered in 1863 by Joseph Wilbrand, a German chemist. Wilbrand discovered TNT but did not realize it was explosive; instead it was originally used as a yellow dye. Wilbrand mixed toluene with sulfuric and nitric acids, creating mononitrotoluene. The mononitrotoluene is then separated and re-nitrated to dinitrotoluene (DNT). In the final step, the DNT is nitrated to TNT using a mixture of nitric acid and oleum. The reaction is exothermic and creates the yellowish TNT. In 1902, TNTís explosive properties were discovered and it was used to make explosive military weapons.

Chemical Properties

Trinitrotoluene, commonly referred to as TNT, starts off as a solid and when detonated, it turns into a combination of carbon, carbon monoxide and nitrogen gases, and energy in an exothermic reaction. The hot gases expand rapidly causing the explosive force of the reaction.

Historical Conflict: World War I

On July 28, 1914, one of the most catastrophic wars began. World War I started with the assassination of Archduke Franz Ferdinand, the heir to the Austria-Hungarian Empire, and ended on November 1918 after more than 37 million people lost their lives. A Serbian group called the Black Hand assassinated the Archduke. They assassinated Ferdinand because they opposed his direction of the Austrian-Hungarian government. Ferdinand planned to expand the dual empire into a triple empire by officially joining together the Balkan territories of Bosnia and Herzegovina, over which Austria had gained control. Austria-Hungary was angry over the assassination and demanded that Serbia bring the assassins to justice. When Serbia did not comply, Austria-Hungary declared war. From this point, the allies of both countries got involved and all of Europe found itself at war. This led to the separation of European countries. Austria-Hungaryís allies were Germany, Italy, the Ottoman Empire, Turkey and Bulgaria. Serbiaís allies were Great Britain, France, Belgium and Russia.

Explosives, primarily Trinitrotoluene, were used as weapons during World War I. Since it is an explosive, TNT was a main ingredient in grenades, military shells, and bombs. For example, the artillery used TNT in a device called the FUZE-VT. These devices were used by soldiers fighting in trenches, which are long deep ditches used as protection. The FUZE-VT had a self-contained triggered radar fuse that detonated within a 20-meter proximity of any object in its flight path.

Despite the abundance of explosives in WWI, most battles ended in prolonged

stalemates. This was a result of trench warfare and using outdated battlefield tactics. In trench warfare, defense is easy, but offense is costly and difficult. Generals would use tactics from the previous generation, such as charging an enemy's entrenched position. This might have worked in some situations prior to WWI, but because of technological advances like machine guns and the explosives used in heavy artillery, it became suicidal. Both sides would wipe each other out and get nowhere, despite all of the explosives used.

Contemporary Conflict: Terrorism

Terrorism is the use of threats and violence to intimidate others. It has often been an effective tactic for the weaker side of a conflict. Extremist groups usually use terrorism because they feel that they have no other choice and it is the only way for their voice to be heard. Terrorism has been used world-wide in situations such as in Irish Republican Army attacks against the British, and most recently the attacks by Al Qaeda against the United States and its allies. A current example of domestic terrorism is the Oklahoma City bombing on April 19, 1995, which was committed by a United States Army veteran, Timothy McVeigh. McVeigh detonated a truck bomb parked in front of the Alfred P. Murrah Federal Building in downtown Oklahoma City hoping to inspire a revolt against what he considered to be an unjust government. McVeigh was prompted in part by a prior incident in Waco, Texas. At Waco, federal agents burned a large compound to the ground after meeting armed resistance from its inhabitants. McVeigh believed this proved that the US government was tyrannical, and therefore, the bombing of a federal building was justified.

Contemporary acts of terrorism and WWI have few similarities. Terrorism involves shadowy organizations or persons, which often sacrifice the lives of innocent civilians. Traditional warfare involves large uniformed armies, which fight in open combat. However, in both types of warfare, explosives have played a key role. In WWI, explosives were used in grenades and bombs against enemy troops and cities. In contemporary examples of terrorism, explosives are used to attack civilian targets. The main explosives used in terrorism are often homemade bombs. For example, in 2001, a man named Richard Reid hid an explosive in his shoe and boarded a domestic air flight to Boston, but he failed in his attempts to detonate it.

Water

Chemical Properties

Water is necessary for life. It covers about 70% of Earth's surface and is important because of its polar nature. Water molecules are made up of one oxygen atom and two hydrogen atoms. Oxygen has a higher electronegativity than hydrogen and pulls electrons away from the hydrogen atoms. The electrons spend more time orbiting the oxygen nucleus than the hydrogen nuclei. The end result is a polar molecule with one partially charged negative end and one partially charged positive end. The negative end of one water molecule is attracted to the slightly positive end of another water molecule, which is called hydrogen bonding. Hydrogen bonding is an important aspect of water because it is responsible for many of the properties necessary for life.

Water molecules stick together and exhibit many cohesive properties because of hydrogen bonds. One example is water functioning as a medium for transport in life forms. This function comes from capillary action, which is the tendency for water to automatically rise through a small tube. For plants, capillary action starts in the roots and pulls water and necessary nutrients up into the stem.

Water has a high specific heat because the hydrogen bonds can absorb a lot of energy before they break. The high specific heat of water helps modulate temperature changes, which is why the temperature change between summer and winter is gradual instead of sudden. The sunís rays hit the water, which warms up the water and keeps the air temperature at a more comfortable level. In winter, less sunlight means that the air temperature is cooler, but is not drastically affected because 70% of the world is covered by water releasing heat into the air, moderating temperature change, and making life possible.

In its liquid state, the random motion allows water molecules to get really close as hydrogen bonds between water molecules are continually made and broken. Ice is less dense than water because the molecules move a great deal less, which forces the hydrogen bonds to remain between neighboring molecules creating an open hexagon lattice structure. The distance between water molecules in ice is larger than the distance between liquid water molecules because of the way they are arranged, making ice less dense than water and providing a floating productive barrier in winter for fish and other aquatic species.

Historical Conflict: Owens Valley

The California Water Wars took place between the city of Los Angeles and the Owens Valley in 1898. These communities fought over water rights, justice and land. An aqueduct was built between Los Angeles and Owens Valley so Los Angeles would have enough water for its residents as its population grew. The conflict began when the city of Los Angeles purchased water rights and land from Owens Valley. Frederick Eaton, the mayor of Los Angeles, and William Mulholland, the superintendent of the Los Angeles Department of Water and Power and future mayor himself, realized that the Owens Valley had a large amount of runoff from the Sierra Nevada mountains, and that building an aqueduct between the Owens Valley and Los Angeles could solve the City's water problem. Eaton was responsible for negotiating the sale. However, he deceived the residents of Owens Valley regarding the proposed use of the aqueduct. Eaton represented himself as a private businessman who needed the water for his personal property. Instead, Eaton intended to appropriate water rights from the Owens Valley River for the City. The residents of Owens Valley knew Eaton was from Los Angeles, but they did not know he represented its government or that he had a friend in the federal government who gave him inside information about an irrigation system that the United States Bureau of Reclamation was planning to build in Owens Valley.

Eaton managed to negotiate rights to almost all of Owens Valley's water, leaving only a small amount behind. By misrepresenting himself in order to negotiate more land and water rights at a lower cost, he started what has become known as the California Water Wars. Eaton bought land as a private citizen and then sold it to the City of Los Angeles, who then owned the rights to a large portion of the Owens Valley water. Eaton and Mulholland convinced Owens Valley that Los Angeles would take water only for domestic purposes, not for irrigation. This was untrue. The first aqueduct was completed in 1913, and was 223 miles long. It

required more than 2,000 workers and the digging of 164 tunnels. By 1928, Los Angeles owned 90 percent of the water in Owens Valley and agriculture in the Valley was decimated.

Water is essential for survival, and is used on a daily basis. In order for the city of Los Angeles to expand and become the great city it is today, it needed to provide sufficient amount of water for its residents. The people of Los Angeles and Owens Valley fought over the water Owens Valley had, after Los Angeles took almost all of it from the river. Los Angeles had advantages that made any other outcome for this conflict impossible. Faced with the political and economic resources supporting Eaton and Mulholland, the farmers of Owens Valley did not stand a chance. First, Los Angeles had more people, which meant it had higher taxes and more complaints about water to deal with. The higher taxes supported a larger government, which increased the political resources available to Los Angeles. Second, the greater population and high number of complaints meant that the government needed to secure a water source at any cost. Owens Valley, on the other hand, did not have nearly as much power as Los Angeles, either in its government or in its individual residents. Because of Los Angelesí many resources, Owens Valley farmers were doomed.

Contemporary Conflict: Water Privatization

The United Nations considers water a basic human right. However, some countries are currently facing a water crisis, and are trying to find a way of getting water to their people without giving up control of their land and natural resources to a corporation. Many developing countries cannot afford to pay for the infrastructure necessary to provide water to all their people. Developed countries can easily afford the infrastructure costs and would like to control water rights in developing countries. Water is big business that can boost an economy greatly. The nations that control the undeveloped countries water include England, Canada, Germany, United States, and France. Big companies such as S2C Global and True Alaska Bottling are using water to make a profit. Currently, these two companies are fighting over the rights to Alaskaís surplus water. They want to take the water from Blue Lake, Alaska, and distribute it to drought-plague cities throughout the Middle East.

The contemporary water conflict is related to the California Water Wars. The Los Angeles aqueduct helped people get water by transporting it from a region that had a surplus of water. Alaska is similarly transporting water to India, which has a water shortage. Los Angeles transported water from Owens Valley because Los Angeles was going through a water shortage. However, Alaska is transporting water to India legally; they are not using deceptive practices. People either traded or legally bought the rights to Blue Lakeís water. The people of Los Angeles were interested in water and keeping it to themselves; the Alaskan people have too much water and want to sell it to another country in need of water. In India, not everyone can afford to buy water, but many other people that can afford it wish to buy it.

Solution

Water privatization is affecting undeveloped countries because they lack access to clean water. The countries most affected by water privatization are parts of Bolivia, Africa and India. These developing regions also lack education about safe water. The water in Africa is very dirty because people are forced to reuse the same water over a long period of time. This creates ideal conditions for water borne diseases. Children in Africa suffer from diseases like

cholera, diarrhea and typhoid from drinking unclean water. A possible solution to this dilemma is to promote public awareness of how water privatization affects poor countries. By providing educational and fundraising programs, this can make a huge difference to children and families. A fundraiser would be a great way of raising money to build wells in Africa and other countries, which lack clean water. We plan to make the public aware of the issue by making fliers, posters, fundraising and giving lectures about how water privatization is affecting poor underdeveloped countries.

Zyklon B

Discovery

Although Zyklon B was first used as a poison to kill rats and insects, it is also believed to have been used against humans in ancient Egypt. It was part of a trap system that killed anyone trying to steal the deceased Pharaoh's belongings. One of the first times it was used in a larger quantity was in World War I by the German army. It was most commonly used in World War II during the Holocaust as a means of carrying out mass genocide. After the Holocaust it was not as common, but people still used it as a pesticide, not unlike its initial use.

Chemical Properties

Zyklon B is a cyanide based pesticide. It is made of hydrogen cyanide, a stabilizer (a chemical that inhibits a reaction between two or more other chemicals), and methyl 2-bromoacetate. Hydrogen cyanide, chemical formula HCN, is a colorless poisonous liquid. HCN ionizes in water producing the cyanide anion, and a hydrogen cation. Cyanide is deadly to humans because it interferes with cellular respiration by inhibiting the enzyme cytochrome C oxdase. A hydrogen cyanide concentration of 300 mg/mL in air will kill a human in about ten minutes. Methyl 2-bromoacetate is a warning odorant, used to give off a warning smell.

Historical Conflict: Holocaust

The Holocaust was a horrible event that left a huge impression on history. It was a genocide that took place under the dictatorship of Adolf Hitler in Nazi Germany. It lasted from 1939-1945 and resulted in the deaths of approximately six million Jews and an additional 5-11 million gays, Gypsies, disabled people, and religious minorities like Jehovah's Witnesses. They were killed by mass shootings, gas chambers, and horribly inhumane living conditions in concentration camps. The Nazi party convinced the people of Germany that Jews were the reason the economy was bad, and that they were trying to take over the world. Nazis used a fraudulent document called The Protocols of Zion as proof of this fabricated conspiracy. Because of this, Nazis saw Jews as a group that they had to get rid of and referred to them as the "Jewish problem." The Wannsee Conference of 1942 was an important event leading up to the Holocaust. During this conference, high figures in the German government and important officials of the Nazi party came together to discuss the "final solution to the Jewish problem." They came to the agreement that it could be "solved" by the extermination of all Jewish people. This led to mass extermination in concentration camps using Zyklon B. Although much of Nazi activity took place in Germany, the Holocaust also flowed into Poland due to the invasion in 1939.

Zyklon B played a big role in the Holocaust. This molecule was one of many methods of execution used by the Nazis. It is very inhumane. Zyklon B causes a slow and painful death. It causes bleeding in the ears, severe skin rash, and foaming at the mouth. When the Nazis used it, victims realized right away that it was harder to breathe, and as time progressed it became more and more difficult. After awhile this deadly gas traveled throughout the body and suffocated the victim to death. In the concentration camps, Nazi forces would gather all prisoners who were unfit to work and place them in a concealed gas chamber. The Nazis put the Zyklon B tablets through the vents. It then traveled to the concealed room and killed everyone in the chamber.

The Holocaust could have been prevented if other large and powerful countries, such as the United States, Great Britain, or the Soviet Union, stepped in and tried to prevent it. Some counties, like the Soviet Union signed treaties with Germany just a couple of years before the Wannsee Conference. By the time some large countries decided to take initiative to begin attacking German forces, it was too late because the damage had already killed thousands of people. For example, the US didnít get involved in the war until after it was well underway. When it did enter, the US and its allied partners refused the request of Jewish leaders to bomb concentration camps, and many countries refused to grant immigration rights to Jews. At the Evian Conference in 1938 most of the participating countries, including all the major European powers, refused to accept Jewish war refuges. Even the Vatican (Catholic Church) never gave a formal denunciation of the Holocaust, even though it did take some actions to help Jews. If the allied powers and the Vatican took larger steps to help Jews earlier in the Holocaust more lives could have been saved and the Holocaust might never have happened.

Contemporary Conflict: Darfur

Even after the Holocaust, the world has not been able to end the horror of genocide. One stark example is the genocide that took place in the Darfur region of Sudan between 2003-2005. The Sudanese government, the Janjaweed militia, and the African Arabs are the three main groups of people who were involved with the genocide in Darfur. This conflict started in 2003 when the northern, mostly Arab, Sudanese refused to equally share power with the southern, mostly black, inhabitants of Darfur. The government equipped a local militia called the Janjaweed to kill anybody who got in their way. However, the Janjaweed got out of control and started killing and raping innocent Sudanese citizens.

The genocide in Darfur and the Holocaust both share common ground because they are both genocides. Although the genocide in Darfur is terrible, the Holocaust was much more systematic and technological due to the death camps and modern infrastructure that supported mass killings. Tens of millions of people were killed as opposed to the hundreds of thousands in Darfur. As opposed to the systemic type of modern genocide perpetrated by the Nazis, decentralized nomadic groups perpetrated the genocide in Darfur with relatively crude methods like hit and run raids. Regardless of the differences in these genocides, they both have affected millions of people and the consequences are still being dealt with.