



Chemistry and Conflict

by the High Tech High Jana/Sharrock Team



Introduction

Chemistry and Conflict was a project developed by Peter Jana and Daisy Sharrock for a 10th grade team during the Fall 2010 semester at High Tech High, San Diego. Its initial inspiration came from a "thing biography" display at a Los Angeles bookstore. The books displayed were about things ranging from salt to political ideologies, written from various disciplinary perspectives. We asked ourselves, "Why not develop a student generated 'thing biography' that integrates Chemistry and History?" The results are in this book.

Each chapter is the product of a collaboration between two students. The chapters focus on the relationship between different chemical elements or compounds and historical conflicts, such as the relationship between isoprene (rubber) and 19th century Imperialism. Students were also asked to study a contemporary conflict, develop a solution to that conflict, and make connections between the present and the past.

The goal was to encourage students to think about connections between the natural world and the social world in ways that are not always apparent. For example, would the history of Africa have been different if rubber was not available in such high quantity or if Europe did not experience an industrial revolution? Is the molecular instability of the uranium atom something that benefits mankind, or would there have been less destruction and conflict if we never learned to harness that instability through scientific means? To help students think about these things, we provided them with a series of guiding questions and also encouraged them to develop their own. We asked several questions, such as, "Was this molecule worth fighting for - or in some cases fighting over?" and "How is the contemporary topic related - or not related - to the historical topic and/or a specific molecule?"

Writing this book was a multistep process. Students created copper etchings of images related to their topics and explored chemical principles through a

historical lens to learn about various elements and compounds; they pursued library research to produce a lengthy paper, and developed their own mini-projects - some using interactive multimedia and original art - all related to a contemporary conflict. Before publication students and teachers engaged in an extensive critique and editing process. All students critiqued each other's work and had to satisfy a student-run editorial board before teachers read their drafts and provided feedback.

We learned as much as our students from participating in this project, and we hope that you can also come away from it with a deeper understanding of the surprising ways in which even the most elemental components of our physical world affect history.

~ Peter Jana and Daisy Sharrock



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 producing water, carbon dioxide 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 as well. When he burned equivalent weights of diamonds and graphite they both produced the same amount of carbon dioxide. 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^2 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^3 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 Earth's 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 parts 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, which was expelled into the air in vast quantities during the Industrial Revolution. Burning wood originally produced fuel for machinery, 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 wildlife 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. 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. That made them much safer to work in, but those were the exceptions. The majority of the mines still have 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 disease 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.



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

Fe

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 workers' 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 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 would eventually put them out of their jobs, or they had already lost their job.

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 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

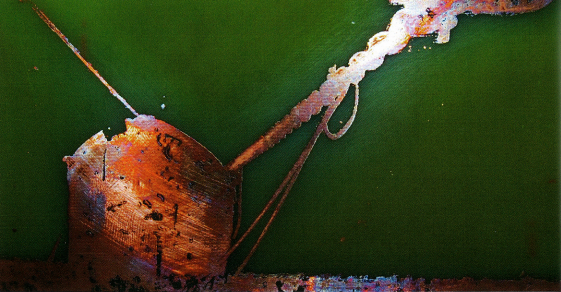
production. Factory owners wanted maximum profits, including the reduction of wages. All sides felt strongly about their beliefs, causing the Luddites to get increasingly extreme with their actions, and the owners to become less inclined to change anything. However, the largest cause of the many conflicts 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 were common in 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 less alert. 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 affect 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

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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.



Cellulose

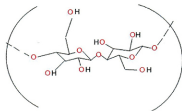
Discovery

In 1818, French chemist Anselme Payen extracted cellulose from plant matter - specifically 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



beta (1-4) linked D-glucose units

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 'stickiness' 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 1600's 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

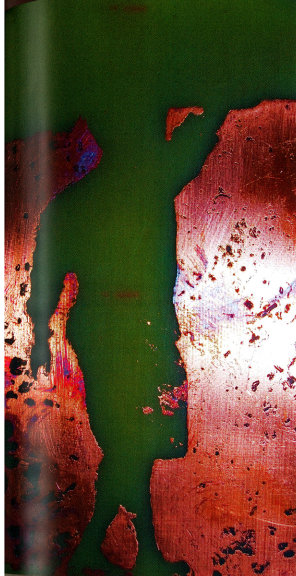
Child labor in cotton factories is still a big problem in China today. Many agencies and factories prefer child laborers because they can do the same amount of work for a cheaper price. The working conditions in these factories are hazardous. Children work with dangerous machines for more than twelve 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.



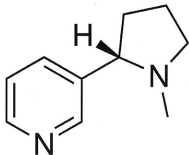
Nicotine

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* 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 and a six membered ring called a pyridine. Nicotine is an alkaloid found in the nightshade family of plants, predominantly in the tobacco plant. Some



3-[(2S)-1-methylpyrrolidin-2-yl]pyridine

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 Nathaniel 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 required 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 led to accommodations that were inferior for 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, "Separate 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

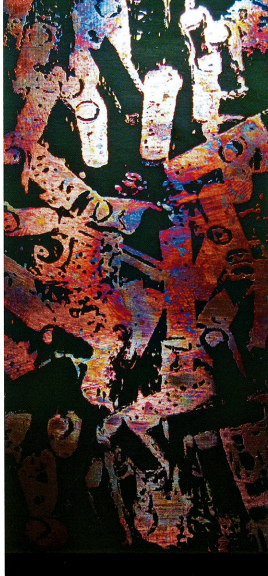
America. It also ended the unequal requirements for African Americans to be able to vote. At the time the only way they could vote was if their grandfather was allowed to vote. The majority did not have sufficient proof of this fact. In the Voting Rights Act of 1965, finally all discriminatory voting practices were outlawed in the United States. This led to the end of the 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 "forcing" 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.



Progestin



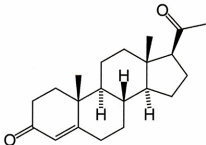
Discovery

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



(6 alpha)-17-Hydroxy-6-methylpregn-4-ene-3,20-dione

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 woman'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 the body 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 the first world war. 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 and 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 teen's 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 women's 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.