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WERE THE DECISIONS TO INTRODUCE NEW

War is not new. What does change is the ways in which war is fought. In World War I (WWI), both the Allies and the Central Powers initially believed they would win easily and quickly as each possessed large, powerful armies they could support for several months. What happened instead was a war of attrition, where the main tactic became to outlast one's opponent, wearing them down physically and mentally by attacking their armies, equipment, and supplies.

In an attempt to give their side an advantage on the battlefield, scientists and inventors worked to improve— and create new—weapons. These new weapons had increased range, firepower, and lethality. Between 1914 and 1918, thousands of soldiers on both sides were wounded and killed in terrible new ways, every day. Soldiers faced horrifying and life-altering injuries. Bullets shattered bones. Explosions ripped off limbs. Poison gas burned and blistered flesh. Shrapnel tore through bodies leaving open wounds.

THE "MACHINE GUN" WAR

At the start of WWI, machine guns were heavy and unwieldy. Guns were positioned on tripods and required four to six soldiers to operate them. They became lighter and more portable later in the war. Germany was the first nation to use machine guns, amassing 12 000 guns at the start of the war, compared to Britain's and France's few hundred. With the ability to fire between 450 and 600 rounds per minute, machine guns killed tens of thousands of soldiers daily.



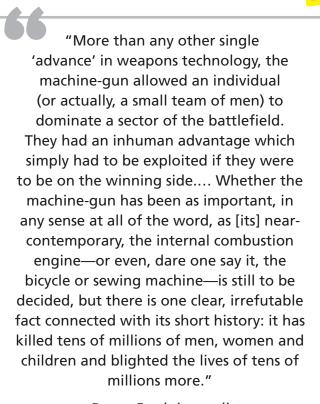
during WWI. Soldiers on both sides dug deep trenches that stretched for thousands of kilometres along the Western Front, from the North Sea coast of Belgium southward through France to the Switzerland border. To break through an enemy trench, enormous quantities of heavy artillery, soldiers, and supplies were needed. Trench warfare made it very difficult for either side to gain territory.

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WEAPONRY DURING WWI JUSTIFIABLE?

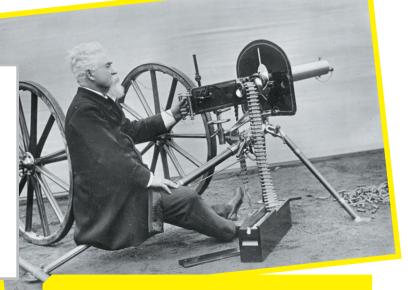
"In 1882 I was in Vienna, where
I met an American whom I had known in
the States. He said: 'Hang your chemistry
and electricity! If you want to make a
pile of money, invent something that
will enable these Europeans to cut each
other's throats with greater facility.'"

 Hiram Maxim, as told to The Times of London newspaper



- Roger Ford, journalist

This quote is from Roger Ford's book, *The Grim Reaper: Machine Guns and Machine-gunners in Action*, published in 1996. Q: What explicit judgment is the author making about the machine gun?



American-born Hiram Maxim invented the machine gun in the early 1880s. He began inventing at an early age, and at 14 years old built a mousetrap that automatically reset itself. Later inventions included a curling iron, an automatic sprinkler, a pocket menthol inhaler, aircraft artillery, an aerial torpedo gun, an automatic steam-powered water pump, and gas motors.

"These are the instruments that have revolutionized the methods of warfare, and because of their devastating effects have made nations and rulers give greater thought to the outcome of a war before entering upon projects of conquest or battling over matters that can be settled by arbitration. They are peace-producing and peace-retaining terrors."

- New York Times

In this 1897 New York Times article, Maxim's machine gun was called a "terrible automatic [engine] of war." Q: Why might the date of this source matter in understanding the views expressed in this article? Is it justifiable to call a deadly weapon a peace producer?

NEL 3

BARBED WIRE AND TANKS

WWI saw the emergence of barbed wire and tanks which were used for both protection and assault on the battlefield.

Barbed wire was originally used in the 1880s to keep livestock in their pens. In WWI, soldiers positioned it around trenches to protect themselves against advancing forces. In this photo, soldiers attempt to cut through barbed wire defenses in Oppy, France. Barbed wire also proved to be a ruthless low-tech weapon, channeling enemy forces into "kill zones" where they were then killed by machine guns or artillery fire.



MAKING A CASE FOR TANKS

In January 1915, Sir Winston Churchill, then First Lord of the Admiralty, wrote to British Prime Minister H. H. Asquith about introducing tanks into the war.

The present war has revolutionized all military theories about the field of fire. The power of the rifle is so great that 100 yards is held sufficient to stop any rush, and in order to avoid the severity of the artillery fire, trenches are often dug on the reverse slope of positions, or a short distance in the rear of villages, woods, or other obstacles. The consequence is that the war has become a short-range instead of a long-range war as was expected, and opposing trenches get ever closer together, for mutual safety from each other's artillery fire.

It would be quite easy in a short time to fit up a number of steam tractors with small armored shelters, in which men and machine-guns could be placed, which would be bullet-proof. Used at night they would not be affected by artillery fire to any extent. The caterpillar system would enable trenches to be crossed quite easily, and the weight of the machine would destroy all wire entanglements.

Forty or fifty of these engines, prepared secretly and brought into positions at nightfall, could advance quite certainly into the enemy's trenches, smashing away all the obstructions and sweeping the trenches with their machine-gun fire, and with grenades thrown out of the top.

Was the decision to introduce tanks on the battlefield reasonable? What evidence does Churchill use to try to convince the prime minister?



Battle of the Somme in 1916, tanks could easily roll over barbed wire, allowing soldiers to cross "No Man's Land" between the trenches. Machine guns and cannons were mounted on tanks to deflect attack from enemy soldiers. However, early tanks often got stuck in the mud, and because they moved slowly, were vulnerable to machine-gun attack. Q: Did the British decision to introduce tanks fairly consider the needs of the British soldiers?

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"... events have proved the utility of Tanks ... both as a means of overcoming hostile resistance ... and as a means of reducing casualties in the attacking troops and I consider that sufficient experience has now been gained to warrant the adoption of the Tank as a recognized addition to the existing means of conducting offensive operations."

- General Douglas Haig, Commander of the British Expeditionary Force (BEF)

Haig wrote to the British War Office on June 5, 1917 to support the decision to use tanks in battle. Q: What does Haig see as the main consequences of adopting tanks in offensive operations?

CHEMICAL WEAPONS

Both the Allies and Central Powers used chemical weapons during WWI. In August 1914, the French army fired tear gas grenades against the Germans. Tear gas incapacitated soldiers by irritating their eyes, mouth, throat, and lungs. On April 22, 1915, Germany released close to 170 metric tons of poison chlorine gas from approximately 5780 cylinders in Ypres, Belgium. Soldiers had positioned the cylinder along a six-kilometre stretch of road close to trenches.

This infographic shows four types of gas that were used as weapons in WWI: tear gas, chlorine, phosgene and diphosgene, and mustard gas. **Examine the infographic for** details about each gas's smell and appearance, its effects on humans, the date of first use, and estimated casualties.

CHEMICAL WARFARE * WORLD

WORLD WAR I IS SEEN AS THE DAWN OF MODERN CHEMICAL WARFARE, WITH A VARIETY OF DIFFERENT CHEMICAL AGENTS BEING EMPLOYED ON A LARGE SCALE, RESULTING IN APPROXIMATELY 1.240.000 NON-FATAL CASUALTIES, AND 91.000 FATALITIES, A VARIETY OF POISONOUS GASES WERE USED THROUGHOUT THE CONFLICT, WITH EACH HAVING DIFFERING EFFECTS UPON VICTIMS



TEAR GASES

Both ethyl bromoacetate and chloroacetone are colourless to light yellow liquids with fruity, pungent odours. Xylyl bromide is a colourless liquid with a pleasant, aromatic odour.

Tear gases are what is known as 'lachrymatory agents' - they irritate mucous membranes in the eyes, mouth, throat & lungs, leading to crying, coughing, breathing difficulties, and temporary blindness.

1914 In August 1914, the French forces used tear gas grenades against the German army, to little effect.

These gases were used to incapacitate enemies rather than to kill; symptoms commonly resolved within 30 minutes of leaving the affected area.



CHLORINE

Chlorine is a yellow-green gas with a strong, bleat like odour. Soldiers described its smell as 'a distir mix of pepper and pineapple'.

Chlorine reacts with water in the lungs, forming hydrochloric acid. It can cause coughing woniting, and irritation to the eyes at low concentrations, and rapid death at concentrations of 1000 parts per million.

1915 Used by German forces at Ypres in April 1915, British forces used it for the first time at Loos in September.

>1,100 Chlorine was devastating as troops were initially unequipped to deal with it. Later, gas masks limited its resetchine real types



PHOSGENE & DIPHOSGENE

Phosgene is a colourless gas with a musty odour comparable to that of newly mown hay or grass. Diphosgene is a colourless, oily liquid.

React with proteins in lung alveoli, causing suffocation. Cause coughing, difficulty breathing and irritation to the throat & eyes. Can cause delayed effects, not evident for 48hrs, including fluid in the lungs & death.

1915 In December 1915, the German forces used phosgene against the British at Ypres.

85% It's estimated 85% of all gas-related fatalities in World War I resulted from phosgene and disphosgene, which phosgene and disphosgene, whi were both used to fill artillery shells.



MUSTARD GAS

When pure, mustard gas is a colourless and odourless liquid, but it's used as a chemical agent in impure form. These are yellow-brown in colour and have an odour resembling garlic or horseradish.

Powerful irritant and vesicant (blistering agent) that can damage the eyes, skin, & respiratory tract. Causes chemical burns on contact with skin. Forms intermediates that react with DNA leading to cell death.

1917 On 12th July 1917, German forces used mustard gas against the British at Ypres.

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The mortality rate of mustard gas casualties was low, but its effects were debilitating, and patients required elaborate care.

CHEMICAL WARFARE

The decision to use poison gas was an attempt to break through the machine gun and trench combination. Using chemical weapons directly violated treaties signed during the 1899 Hague Convention. The treaties outlined the rules of war, including the prohibited use of poison or poisoned weapons. After Ypres, other nations such as Britain and France followed with their own poison gas attacks.

Throughout the war, 3000 chemicals had been investigated for military use and approximately 50 were deployed on the battlefields in Europe. By the end of the war, the use of chemical warfare resulted in approximately 91 000 deaths and 1.2 million non-fatal casualties.

An excerpt from the poem "Dulce et Decorum Est" by British soldier Wilfred Owen. The title is Latin, meaning "It is sweet and right." It was written during the war, and published after his death in 1920. The poem detailed the horrors of chemical warfare. Q: What implicit judgments is the poet making about chemical warfare?

"Looking across to the German trenches at about five in the afternoon, they saw a series of sharp puffs of white smoke and then trundling along with the wind came the queer greenish-yellow fog that seemed strangely out of place in the bright atmosphere of that clear April day. It reached the parapet, paused, gathered itself like a wave and ponderously lapped over into the trenches. Then passive curiosity turned to active torment—a burning sensation in the head, red-hot needles in the lungs, the throat seized as by a strangler. Many fell and died on the spot. The others, gasping, stumbling with faces contorted, hands wildly gesticulating, and uttering hoarse cries of pain, fled madly through the villages and farms and through Ypres itself...."

- A.T. Hunter, Canadian soldier

A first-hand account of the first chlorine gas attack at Ypres. Q: How does learning about the effects of chemical warfare in WWI help us to respond to the use of chemical warfare today?

Dulce et Decorum Est

Gas! Gas! Quick, boys!—An ecstasy of fumbling, Fitting the clumsy helmets just in time; But someone still was yelling out and stumbling, And flound'ring like a man on fire or lime ... Dim, through the misty panes and thick green light, As under a green sea, I saw him drowning ...

– Wilfred Owen

Gassed is a painting by British artist John Sargent. The painting shows the aftermath of an August 1918 mustard gas attack on the Western Front as witnessed by the artist. Q: What details do you see in the painting? Is the artist making any implicit or explicit ethical judgments? If so, what are they?



"In the middle of January I received orders to go and see Geheimrat Haber, who was in Brussels on behalf of the Ministry of War. He explained to me that the Western fronts, which were all bogged down, could be got moving again only by means of new weapons. One of the weapons contemplated was poison gas. In particular chlorine, which was to be blown towards the enemy from the most advanced positions. When I objected that this was a mode of warfare violating the Hague Convention, he said that the French had already started it—though not to much effect—by using rifle-ammunition filled with gas. Besides, it was a way of saving countless lives, if it meant that the war could be brought to an end sooner."

- Otto Hahn, German soldier

Geheimrat Fritz Haber was the German chemist who, in 1914, proposed the use of chlorine gas on Allied troops. Q: If a decision to break the rules of law saves more lives in the long term, is it justifiable?

"It is a cowardly form of warfare which does not commend itself to me or other English soldiers. We cannot win this war unless we kill or incapacitate more of our enemies than they do of us, and if this can only be done by our copying the enemy in his choice of weapons, we must not refuse to do so."

 Lieutenant General Sir Charles Ferguson, commander of II Corps

The British expressed outrage at Germany's use of poison gas, but developed their own gas warfare capability. Q: What judgment is Ferguson making about the use of chemical weapons? Was his resulting conclusion reasonable?

"I am not pleased with the idea of poisoning men. Of course, the entire world will rage about it at first and then imitate us."

 Rudolf Binding, German officer, poet, and novelist

An excerpt from the diary of Rudolf Binding on April 24, 1915, two days after the German army first used chlorine gas.

MAKING ETHICAL JUDGMENTS

Ethical judgments are used to determine whether the events, decisions, actions, or policies of a person or group were right or wrong, just or unjust, and fair or unfair. Ethical judgments are important because they can help you understand and make sense of the past and present. They can help you consider what responsibilities you may have for remembering and responding to what happened in the past.

Make a reasoned ethical judgment about the introduction of new weapons during WWI when considering the medical advancements that resulted.

- Analyze: Read and analyze the sources that follow to understand the impact new weapons had on medical innovations.
- 2. Consider: Consider the severity of the injuries that soldiers suffered. How does learning about these injuries help us understand the relationship between war and medicine?
- 3. Discuss: How should we judge the introduction of new weaponry when viewed through the lens of medical advancements?

"A war benefits medicine more than it benefits anybody else. It's terrible, of course, but it does."

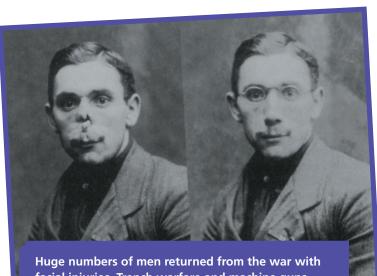
- Mary Merritt Crawford

A quote from Mary Merritt Crawford, a surgeon at the American Ambulance Hospital during WWI.

"Medicine, in World War I,
made major advances in several directions.
... doctors learned enough to vastly
improve a soldier's chances of survival.
They went from amputation as the only
solution, to being able to transport
soldiers to hospital, to disinfect their
wounds and to operate on them to
repair the damage wrought by artillery.
Ambulances, antiseptic, and anesthesia,
three elements of medicine taken entirely
for granted today, emerged from the
depths of suffering"

- The Atlantic

An excerpt from a February 24, 2017 article in *The Atlantic*, titled "How World War I Revolutionized Medicine."



Huge numbers of men returned from the war with facial injuries. Trench warfare and machine guns contributed to many of these severe disfigurements. Prior to WWI, they would have worn masks to cover their wounds. Doctors such as Harold Gillies and Henry Pickerill developed new ear, nose, eye, and jaw reconstruction procedures. Gillies was the first to use a patient's own tissue to reduce the risk that the body would reject the skin graft.

8 NEI



Large-scale artillery shells and machine guns inflicted major damage on soldiers' bodies. Over 41 000 men had limbs amputated during the war. As a result, the manufacture of prosthetic limbs became faster and the prostheses themselves were designed better and fit more comfortably.



At the start of the war, X-ray machines were in city hospitals and injured troops were far away on the battlefield. Marie Curie, a Nobel-Prize winning French physicist and chemist, invented the mobile X-ray machine. This machine allowed surgeons to find machine gun bullets and small pieces of artillery shell shrapnel in soldiers during surgery on the battlefield. The mobile X-ray machine vastly improved a soldier's chance of survival.



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