

# Chemistry for War or Peace?

100 years of chemical weapons  
'Fires, Episode 1: A teacher's mission'

2013 Chrétien Schouteten

## Background

The OPCW, the Organization for the Prohibition of Chemical Weapons, stimulated the making of the film 'Fires, Episode 1: A teacher's mission'. 'Fires' is one of the ways to illustrate the problems which chemical weapons still pose to the world. This was demonstrated in 2013 by the use of chemical weapons in the conflict in Syria. Another reason for this film and other activities lies in the centennial of the start of the First World War, in which chemical weapons were used on a large scale for the first time.

The OPCW would like to increase the knowledge and awareness of the general public about the ethical issues that a chemist may encounter. This film is one way of drawing attention to the moral dilemmas a chemist may face.

The lesson material, of which this introduction is a part, uses the film as a starting point. It shows how Chrétien Schouteten, a chemistry teacher in Groningen, The Netherlands, devoted much of his time to developing teaching material about chemical weapons. The film also has interesting footage of the training of OPCW inspectors, as well as the actual field work they do.

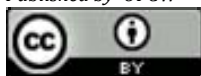
The film is available in English (with subtitles in Arabic, Chinese, French, Russian and Spanish) at [www.thefiresproject.com](http://www.thefiresproject.com)

The main part of this lesson material is a text about Fritz Haber, the German chemist who was responsible for the introduction of chemical weapons on the battlefield in 1915, as well as the nitrogen binding process for which he received the Nobel Prize in Chemistry in 1918.

The last part gives some information about the OPCW, founded in 1997, working toward a world without chemical weapons.

Approaching the centennial of the First World War during which chemical weapons were used in great amounts, the end of the era of chemical weapons seemed at an end. The recent incidents in Syria unfortunately show otherwise. The OPCW has the goal of eliminating chemical weapons and has recently been very active doing just that. The OPCW received the Nobel Peace Prize for 2013 for its activities in eliminating chemical weapons.

*Colofon:*  
*This material was written by Chrétien Schouteten,*  
*English text Jan Apotheker*  
*Published by OPCW*



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## Introduction

This educational material can be used together with the film 'Fires, episode 1: a teacher's mission', produced by Eric Vander Borcht (OPCW Media and Public Affairs Branch). The film is available at [www.thefiresproject.com](http://www.thefiresproject.com). The material is meant for one lesson of 45-50 minutes in grade 10 or 11. The lesson material uses Fritz Haber as an example of the dilemmas a chemist faces when asked to develop chemicals for non-peaceful uses. The material and the questions are meant to encourage a discussion about the role of chemists and the use of chemistry for ethical purposes.

## Learning objectives

After the session students:

- Are aware of the ethical dilemmas that chemists could face
- Know more about the Chemical Weapons Convention and the tasks of the Organization for the Prohibition of Chemical Weapons
- Become aware of their own responsibility

## Discussion

At the end of the lesson, questions you might raise with the students are:

- What did you think was surprising?
- What was interesting?
- What was valuable?
- Would you like to know more about the theme: 'chemistry for war or peace'?

Possible lesson schedule

Time	subject	activities	materials
0-5 min	Introduction of the film/ agenda of the lesson	Direct instruction	
5-25 min	Show the film 'Fires'		DVD
25-30 min	First reaction		handouts
30-45 min	Discussion in groups based on handouts	Groups of 3 or 4 students	
45-50 min	Evaluation with the students	Interactive discussion	

More material about the work of the OPCW as well as dual-use chemicals will be available later in 2014.

# 100 years of chemical weapons chemistry for war or peace?

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## Fritz Haber: Hero or criminal?



Photograph 1. Fritz Haber

Fritz Haber was a German chemist (1868-1934). He developed a way to bind nitrogen from the air, using high pressure, temperature and a catalyst, forming ammonia. This in turn could be used to make fertilizer, making agriculture independent from animal manure. He was awarded the Nobel Prize in Chemistry for his work in 1918.

During the First World War the nitrates derived from this process were also crucial for the production of explosives and ammunition. Without this process Germany would not have been able to continue the war.

Fritz Haber was a committed patriot, like many scientists at the beginning of the 20<sup>th</sup> century. He was dedicated to the German cause in the First World War. He defended his commitment by saying:

*“A scientist belongs to his country in times of war and to all mankind in times of peace.”*

In the autumn of 1914 it became clear to Fritz Haber that the war in the trenches was bogged down. He realized the possibilities offered by the use of poisonous gases, which could be used in the trenches to break the deadlock. He thought that the development and use of chemical weapons was indispensable. The first use of chlorine as a weapon under his leadership, took place near Ieper on the Belgian front on 22 April 1915. Chlorine was used because it was poisonous, and because it was easily available as a byproduct from German industries. (If you look at <http://youtu.be/7Gp2wx2zIRI> you can get an idea of what it must have looked like).

### Assignment 1

*Find out how chlorine works on the human body. What are the effects? What safety precautions are taken for example in a pool or in a laboratory to be able to use chlorine in a responsible manner? The use and production of chlorine in the classroom has been forbidden. If you want to learn a bit more about chlorine you could look at <http://youtu.be/BXCfBl4rmh0>.*

The chlorine was transported by a favourable wind to the unprotected enemy trenches where the French and Algerian soldiers were completely surprised. The use of chlorine in Ieper led to more than 1,000 casualties and over 10,000 wounded. Many soldiers fled in panic. Without serious opposition the Germans were able to cross the no man's land between the trenches and reach the enemy trenches. The front was breached over a distance of 8 km. This was the first successful chemical attack. The territorial gain was only 4 km however because the Germans were not prepared for the success of the attack.

Fritz Haber had hoped that the use of chlorine would break the impasse. He expected a shorter war, a quicker German victory, and fewer casualties and wounded on either side. The German army staff did not expect much from the military effects of the poison gas. That is why there were not many troops in reserve to advance to the Belgian coast. Fritz Haber felt the short-sightedness of the German army staff had lost a unique opportunity to force a military victory sustaining limited losses. He thought the German army staff had made a tragic error of judgment.

*Assignment 2*

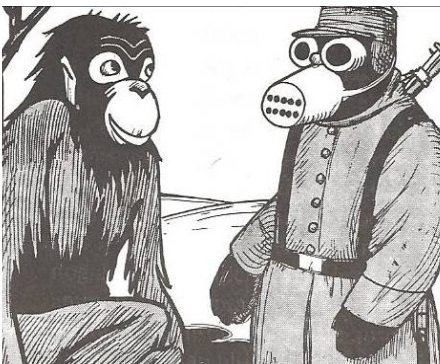
*Do you agree with Fritz Haber? Or do you understand the German army staff's decision?*



*Photograph 2. Australian forces*

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The allied side was outraged by the use of the chlorine. The Commander-in-Chief of the British forces, Sir John French, said that the German use of chlorine showed “a cynical and barbarous disregard of the well-known usages of civilized war and a flagrant defiance of the Hague Convention.” He went on to say “As a soldier I cannot help expressing the deepest regret and some surprise that an Army which hitherto has claimed to be the chief exponent of the chivalry of war should have stooped to employ such devices against brave and gallant foes.” This moral outrage is illustrated by figure 3, a cartoon by the Dutch cartoonist Albert Hahn.



*Figure 3. van mensaap tot aapmens*

### *Assignment 3*

*What was Albert Hahn's message?*

Under international law it was forbidden to poison water wells, foodstuff and weapons. The use of shells filled with poison was also forbidden. Weapons were not supposed to cause unnecessary grief. Fritz Haber compared the outrage with that of a knight (with armour and lance) fighting a soldier armed with firearms.

### *Assignment 4*

*According to Haber the use of chlorine was little different from the use of smoke and burning sulphur in the Peloponnesian war (431-404 BC) between Sparta and Athens. He argued that the development of the chemical industry had made possible the further development of military techniques.*

*What do you think of Fritz Haber's argumentation? Is the use of modern inventions unavoidable in warfare? Compare also to the development of nuclear fission bombs.*

After the deployment of chlorine in Ieper a chemical arms race developed. Chemists on both sides developed new chemical weapons like phosgene and mustard gas, which were used on a large scale. By the end of the First World War, chemical weapons had caused around one million casualties, of which about 90,000 were fatal, and many survivors were left blind or chronically disabled. However, chemical weapons were actually fairly ineffective weapons. In Germany Fritz Haber remained in charge and is therefore widely considered to be the 'father' of chemical warfare.

## The OPCW: the Organisation for the Prohibition of Chemical Weapons

| What is the OPCW?



Since 1997, the OPCW, has had its headquarters in The Hague, the Netherlands, from where it oversees the implementation of the Chemical Weapons Convention. This convention was adopted by the United Nations in 1992. It prohibits the development, production, stockpiling and use of chemical weapons. This prohibition applies to all OPCW Member States. One of the Convention's main goals is the destruction of all chemical weapons and of the facilities that produced these chemicals. The Chemical Weapons Convention is the statutory framework to ensure that toxic substances will never again be used for hostile purposes.

Important Tasks of the OPCW:

### Disarmament

The primary task of the OPCW is disarmament. Before 1997 several countries possessed large stockpiles of chemical weapons . By now 190 states are Member States of the OPCW. They represent 98% of the worlds population. Over 80% of the stocks of chemical weapons has already been destroyed. Doing this safely while protecting people and the environment is, chemically speaking, rather a challenge. Almost 90% of the facilities that produced chemical weapons have either been destroyed or converted into facilities for peaceful uses.



figure 4. stockpile of chemical weapons in the United States of America

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### Prevention

One of the main tasks of OPCW is prevention. Together, the national authorities of OPCW Member States and the inspectors from the OPCW regularly check industrial facilities and monitor the trade in chemicals to make sure no new chemical weapons are being produced. The dual-use nature of chemicals is an important issue in this respect. Chemicals can be used for pesticides for example, but can also be used to produce

chemical weapons. Specially trained personnel are able to investigate allegations of the use of chemical weapons, as has happened recently in Syria.



Figure 5. Inspectors from the OPCW at work

#### Support and protection

OPCW has built up a knowledge base about chemical weapons. It is able to provide training for personnel of Member States and it also has programmes to promote the peaceful uses of chemistry and international cooperation between Member States.

#### Expansion to all states

The OPCW aims at having all states become members of the OPCW. At this moment only a few countries have not yet joined the CWC. Israel and Myanmar have signed the CWC but still need to ratify it. Angola, North Korea, Egypt, and South Sudan have not yet signed. Syria was the most recent state to join the CWC.

The ban on the use of chemical weapons also applies to the states that have not yet joined the CWC. That is why the use of chemical weapons is not only unacceptable, but also unlawful according to international law. However, while the ban on the use of chemical weapons is widely accepted, the international community has only limited possibilities to enforce the international law.

On 20 March 2013 the United Nations Secretary-General Ban Ki-moon asked to investigate the alleged use of chemical weapons on 19 March 2013 in Kahn al-Assal. The UN Secretary-General asked the OPCW to assist in carrying out this investigation. The investigation team travelled to Syria in August 2013 and confirmed the use of chemical weapons. The outcome of subsequent diplomatic efforts was that Syria joined the CWC and became a member of the OPCW, and OPCW inspectors are now working alongside United Nations personnel in Syria to verify the removal of chemical weapons from Syria and their destruction.

#### Assignment 5

*Countries in the Middle East have indicated they will only join the CWC if other countries in the region will join as well. What do you think of this attitude?*