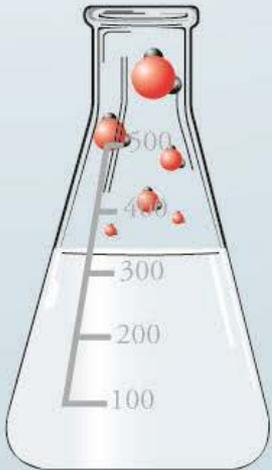
A series of water molecules (H<sub>2</sub>O) are arranged in a descending arc from the top left towards the center. Each molecule consists of one large orange sphere (oxygen) and two smaller grey spheres (hydrogen).

# Science and Technology

## Chemical Weapons in the Middle East



# Egyptian Involvement in Yemen Civil War (1963-1967)

- Monarchy in Yemen overthrown in 1962
- Egypt supported new government and helped to suppress royalist groups
- Royalist fled to caves...hard to get with conventional weapons.



## Egyptian Involvement in Yemen Civil War (1963-1967)

- Early 1960s, Egyptian President Gamal Abdel Nasser pursued CW.
- Foreign assistance from Moscow and Germany, some of whom helped develop CW for Hitler
- In 1963, Egyptian forces used tear gas, phosgene, and mustard gas on the royalist guerillas in their mountain caves
- CW were either from abandoned British CW or from new ones supplied by the Soviet Union.

## Egyptian Involvement in Yemen Civil War (1963-1967)

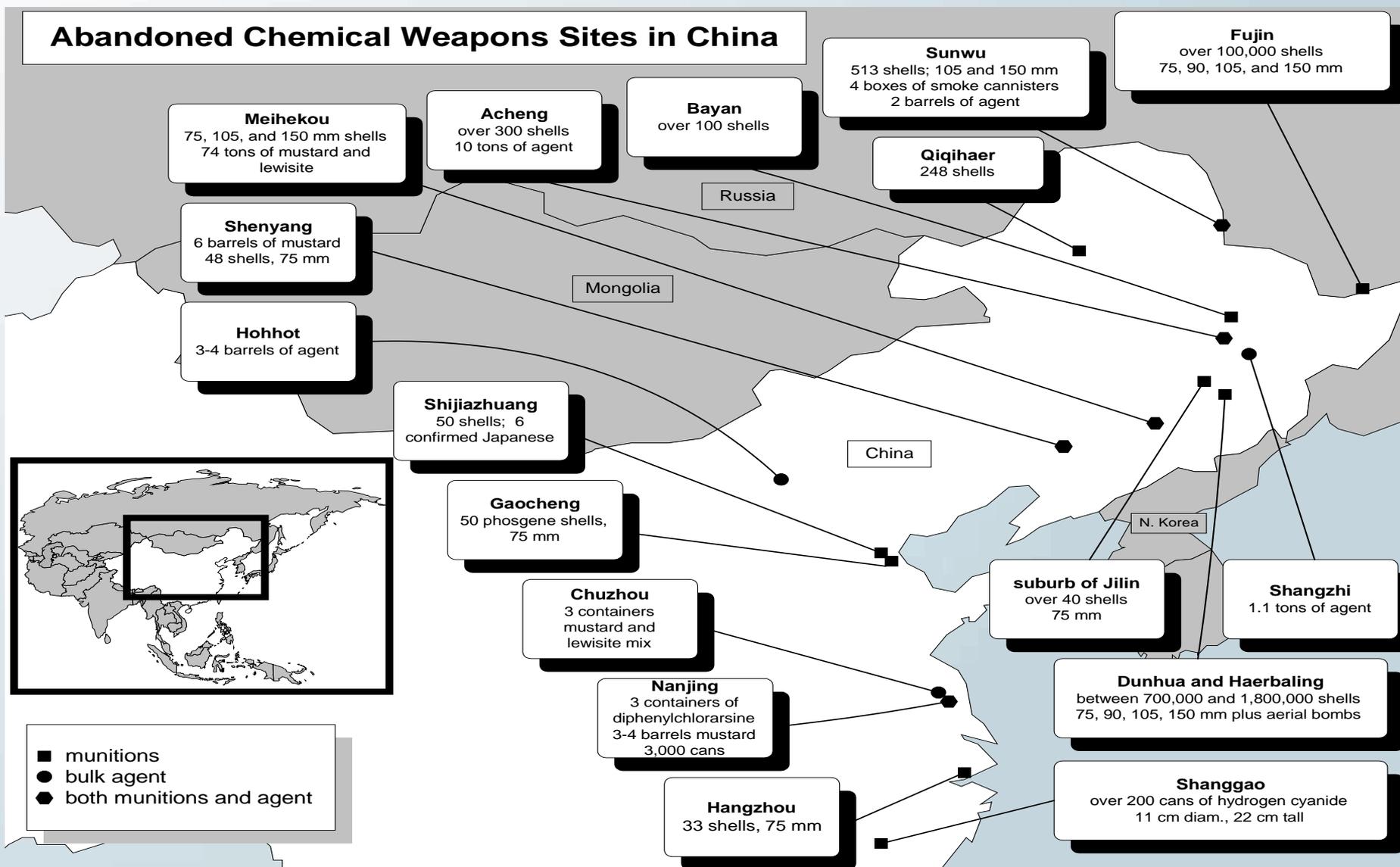
- Saudi Arabia filed complaint with U.N. claiming Egypt violated the 1925 Geneva Protocol that Egypt had signed and ratified.
- Nasser denied use of CW
- Journalists in Yemen in 1967 reported a large chemical attack that killed over 100 people. The effects on the people harmed suggested the possible first use of nerve gas in warfare.

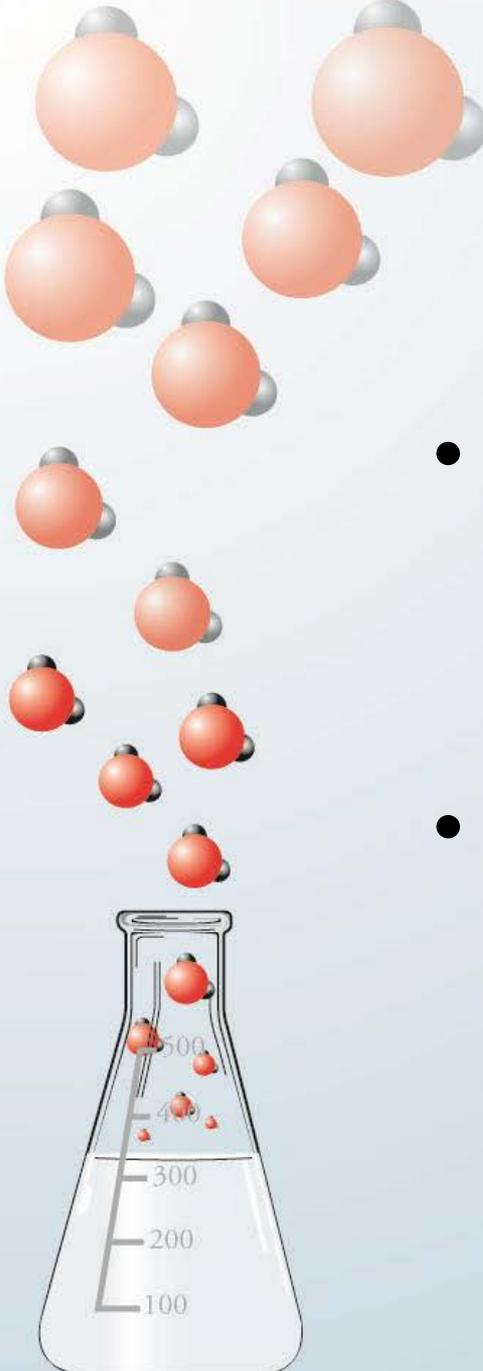
# Legacy of World War II: Abandoned CW in China

- China alleges 2,000,000 shells ; Japan claims 680,000 shells.
- At least 17 sites (mostly in Manchuria)
- Many munitions are rusted and leaking.
- 2,000 CW casualties since WW II
- Japan has agreed to take responsibility for destruction.



# Abandoned CW in China





## Case Study: Iraq

- Before the 1991 Persian Gulf War, Iraq possessed the largest and most sophisticated CW program in the developing world.
- Due to UNSCOM inspections, more is known about Iraq's CW program than any other country.

# Iraq and Chemical Weapons: Motivations

- CW of military value in defensive/offensive operations against Iranian troops in the Iran-Iraq war (1980-1988)
  - Fend off human wave attacks
- Also useful for internal security purposes
  - Depopulate anti-government Kurdish villages
- Threat of CW retaliation to deter Israeli attack
- Raise costs of Allied invasion
  - Exploit U.S. sensitivity over mass casualties

# Iraq's Chemical Arsenal: Agent Types

- Produced large quantities of blister agents
- Produced hundreds of tons of “nerve” agent
  - Tabun & sarin were of poor quality, only 4-6 week shelf-life
  - production of VX as early as 1985 and continuously until December 1990 “on an industrial scale” (2MT/day)
- Produced large amounts of a glycolate anticholinergic incapacitating agent known as “Agent 15,” which is believed to be either identical to BZ or a closely related derivative

# Iraq's Chemical Arsenal: Munitions

- Iraqi CW agents were deployed in a variety of munitions.
- Developed crude binary munitions, whose precursors were mixed manually by front-line personnel prior to use
- Developed a special CW version of the 122mm rocket, in which 2-3 agents could be mixed and matched
- Produced 50 binary chemical warheads for the *Al-Hussein* missile (modified *Scud-B*)
  - contained alcohol precursors for 60:40 mixture of sarin/cyclosarin (GB/GF, respectively)
  - at least three CW flight tests prior to the Gulf War

# Iraqi CW Use in War with Iran

*“The invaders should know that for every harmful insect there is an insecticide capable of annihilating it, whatever their number, and Iraq possesses this annihilation insecticide.”*

An Iraqi government radio broadcast

- Believed to have commenced in Spring `82 with nonlethal gas (e.g. CS) to stem human wave attacks.
- Escalated to use of lethal gas in Summer 1983 as Iran crossed into Iraqi territory.
- Increased use probably to offset Iran’s superior human resources.
- Use continued until ceasefire in 1988.
- Estimated use of CW in 1982-1988 : 195 times
- UN sent six investigation teams to Iran; four to Iraq during 1984-1988.

# Iran-Iraq War (1980-1988)

- 1982: Tear gas (CS)
- 1983: Haj Umran, *mustard gas*
- 1983: Penjwin, *mustard gas*
- 1984: Siege of Basra, *Tabun, mustard gas*



1988: Majnoon Island, mustard gas, Tabun

1988: Chemical warfare against the Kurds with mustard gas, Tabun

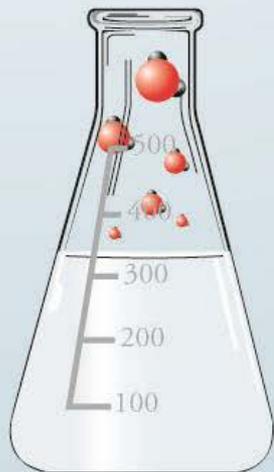
# Iran-Iraq War (1980-1988)

- By 1987
  - Simultaneous use of non-persistent nerve gas on forward positions and persistent mustard gas against rear areas.
  - 1500-2000 CW-filled rockets fired in battle of Al Faw (1988).
  - Bombing with multiple CW agents inflicted 5000 casualties (15% fatal) in Battle of Majnoon Island (1988)
  - Some Soviet technical advice, training suspected
- All told, estimated 45,000 Iranian casualties due to Iraqi CW



## Iraq Versus the Kurds

- al-Anfal campaign against the Kurds involved chemical attacks against Kurdish villages in 1987 and 1988
- Most infamous: Halabja, March 17, 1988; alleged use of mustard gas, nerve agents, cyanide. Estimated killed was 5,000 persons.

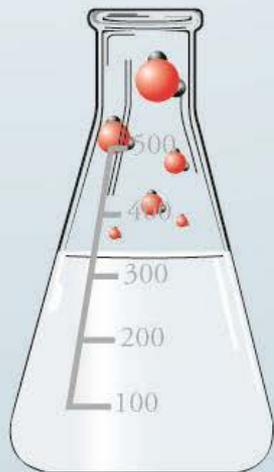


# Iraqi CW and the 1991 Gulf War

- Preparations
  - Sheltered CW stocks built up on Iraqi territory near Kuwait Theater of Operations (KTO)
  - CW protection and decontamination gear dispensed to troops in KTO
  - Detailed instructions on use issued to unit commanders
  - Aircraft conspicuously loaded with CW, then unloaded

## Iraqi CW and the 1991 Gulf War

- Possible explanations for lack of large-scale CW use
  - Short shelf-life of agents, compounded by inability to replenish following Allied bombing of production plants
  - Attrition of Iraqi command and control system, as well as delivery systems (i.e. artillery)
  - Fear of non-conventional retaliation by Allies or Israel
  - Adverse weather and wind conditions blowing northward



# Iraqi Command and Control

- Overall command apparatus highly centralized, with Saddam Hussein exercising personal control
  - Saddam routinely intervened at corps and division level.
- Frequent use of CW against Iran
  - Saddam initially approved on case-by-case basis.
  - In late 1986, he delegated use authority to lower levels of command.
- In 1990, Saddam Hussein warned Israel that he had pre-delegated authority to retaliate to a nuclear attack with strategic CW strikes against Israeli cities.
  - Hedge against “decapitation” of command structure

# Iran and CW

- With help from Western European countries, facilities were built in Iran for making mustard gas, phosgene, and hydrogen cyanide.
- Ayatollah Khomeini was against CW on religious grounds (Koran forbid *poisonous weapons*).
- 1987 – Khomeini relented and authorized CW against Iraq
- Used CW in 1987 and 1988 with little military impact
- Later banned use but continued to create a stockpile of CW for possible future use.
- Signed and ratified the CWC.
- Claims all CW destroyed.

# Case Study: Libya History

From <http://www.nti.org/country-profiles/libya/>

- Early 1980s – Libya begins to develop chemical weapons – motivations may have been
  - To compensate for Libya’s relative military weakness compared to likely opponents (Israel and Egypt)
  - Other countries in the region thought to be developing chemical weapons...Egypt, Iraq, and Syria.
- 1985-2003 – three chemical weapons facilities constructed
  - Pharma-150
    - 75 miles south of Tripoli
    - Disguised as a pharmaceutical plant
  - Pharma-200 underground 650 miles from Tripoli
  - Pharma-300 or Rabta II at Tarhunah
    - Two 200-450 ft tunnels covered with 100 ft of sandstone shields and lined with reinforced concrete.

# Case Study: Libya

Rabta  
Tarhunah



# Libya's Suspected Plant at Tarhunah

U.S. released artist's rendition of entrance to Tarhunah site as part of public campaign to put pressure on Libya.



# International Help for Pharma-150

- Ihsan Barbouti
  - Iraqi-born businessman
  - His Frankfurt-based engineering firm was linked to a CW plant in Iraq.
  - Used front companies to ship chemical equipment, supplies, construction plans, and personnel to Libya
  - Involved 30 German companies, several Austrian engineers, and Swiss banks
- Prime contractor Imhausen-Chemie, West German company
- Most equipment and supplies left European ports with false documents
- Used front companies to reroute equipment and supplies through ports in the Far East

# International Help for Pharma-150

- Construction done under tight security by 1300 low-wage workers from Thailand.
- Libya claimed it was a pharmaceutical plant, but unusually large and spread out for that.
- Ringed by high fences
- Because production facility enclosed in warehouse-like structure, overhead photography not useful in identification, except for oversized air-filtration system suggesting CW production
- Intelligence agencies questioned foreign workers, who described the plant equipment layout, leading to the conclusion that the plant had a CW facility, a storage building, and a metal-working plant suitable for making munitions

# International Help for Pharma-150

- West German government obtained plans of plant, showing strong security facilities, including airtight windows and doors, gas-tight walls, burn-off unit, corrosion-resistant lining of pipes, and escape routes.
- August 1988: accidental spill, releasing toxic wastes, killing pack of wild desert dogs whose bodies were detected by satellite...Panicked Libyan officials called Imhausen-Chemie for emergency advice, and U.S. intelligence intercepted the conversation.
- September 14, 1988 – State Department, *“The U.S. now believes Libya has established a CW production capability and is on the verge of full-scale production of these weapons.”*

# Libya CW History

From <http://www.nti.org/country-profiles/libya/>

- 1988 – President Reagan threatens air strike against Parma-150 plant.
- January, 1989 – West German (Imhausen-Chemie) and Japanese companies found to be aiding in the construction of Pharma-150.
- 1990 – U.S. intelligence community learns of China's plan to supply Libya with about 10,000 tons of saran and tabin precursors.
- May 1990 – before U.S. is able to attack facility, satellite photos show what was thought to be a fire at the facility...turns out to be tire fire...U.S. accuses Libyans of faking fire to avoid attack.
- 1993 – Libya and other Arab countries initially reject CWC.

# Libya CW History

From <http://www.nti.org/country-profiles/libya/>

- October 2003 – Libya consents to U.S. and British inspections of laboratories and military facilities
- 19 December 2003 – Libya publically announced intention to abandon development of WMD. This was the first admission of CW production.
- 2 February, 2004 – Libya becomes 159<sup>th</sup> state party to join CWC.
- March 2004 - arsenal of aerial bombs crushed by bulldozers
- Two of the former chemical weapons production facilities demolished down to their foundations
- With OPCW's approval, third facility converted into a pharmaceuticals plant

# Libya CW History

From <http://www.opcw.org/the-opcw-and-libya/>

- November 2005 – OPCW grants Libya an extension until December 2011 for destruction of CW
- October 2010 – destruction of sulfur mustard started - 55% destroyed
- February 2011 - heating component of the neutralization unit malfunctioned...operations suspended. OPCW recalled its on-site inspectors until destruction activities could resume.
- Due to the mounting crisis, the spare part needed to repair the destruction facility could not be delivered. The OPCW moved the destruction deadline to 29 April 2012, the maximum allowable under the Convention.

# Libya CW History

- 2011 – Qaddhafi did not use CW against those participating in the uprising...maybe due to only limited amount of CW and no delivery system...success of CWC?
- 16 September 2011 - The United Nations formally recognized the new government in Tripoli as the legitimate authority of Libya, which assumed Libya's obligations under the CWC to complete destruction of the remaining stockpiles.
- The OPCW Technical Secretariat is now engaged in regular consultations with the Libyan government and other Member States to enable the return of OPCW inspectors to examine conditions at the storage depot and verify destruction operations when they recommence.
- See <http://www.opcw.org/the-opcw-and-libya/> for further updates.

# Chemical Weapons Still in Libya

From 28 September, 2011 <http://www.opcw.org/news/article/captured-chemical-weapons-in-libya-were-declared-to-the-opcw-by-former-government/>

- Libyan sources have informed the OPCW that they are taking all necessary measures to control stockpiles of chemical weapons that were captured last week.
- These are the same stocks that were declared to the OPCW by the former regime of Muammar Qaddafi in compliance with the Chemical Weapons Convention (CWC).
- The OPCW has not been advised by the Libyan sources of the discovery of any previously undeclared stockpiles.

# Chemical Weapons Still in Libya

From 28 September, 2011

<http://www.opcw.org/news/article/captured-chemical-weapons-in-libya-were-declared-to-the-opcw-by-former-government/>

- Remaining chemical weapons stored at a military facility about 700 kilometers southeast of Tripoli.
- Stockpiles consist of about 9 metric tons of sulfur mustard agent and over 800 metric tons of precursor chemicals.
- The new government in Tripoli, which has been recognized by the United Nations, inherits Libya's obligations as a State Party to the CWC to destroy the remaining stockpiles in their entirety under international verification by OPCW inspectors.

# Chemical Weapons Still in Libya

From 28 September, 2011

<http://www.opcw.org/news/article/captured-chemical-weapons-in-libya-were-declared-to-the-opcw-by-former-government/>

- The OPCW is closely monitoring developments in Libya and will be prepared to return its inspectors to the country as soon as circumstances permit. Once destruction activities are able to resume it should be possible to destroy the remaining sulfur mustard agent, which poses the biggest concern, within a month.

# Libya Chemical Weapons

From <http://www.opcw.org/the-opcw-and-libya/libya-fact-and-figures/>

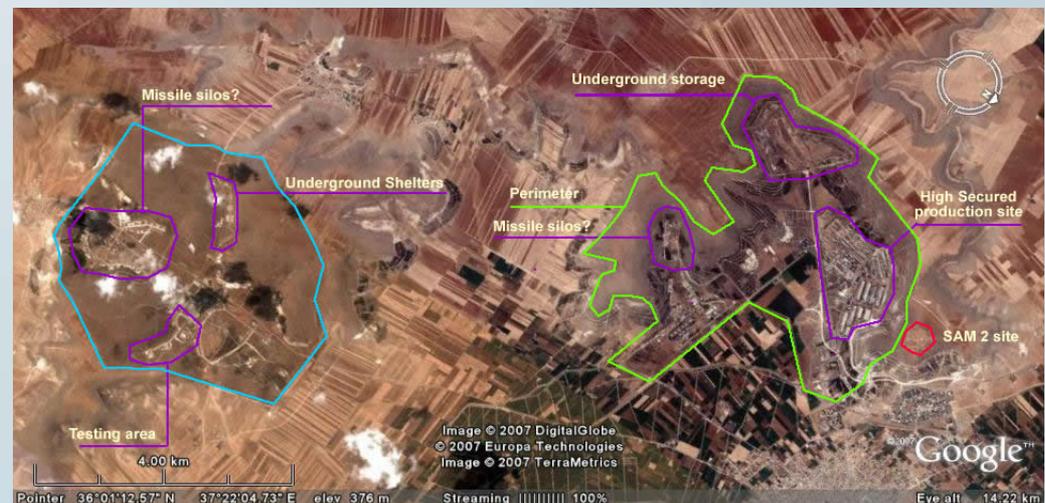
- Libya declared possession of the following materials, which were verified by OPCW inspections:
  - 24.7 metric tons of sulfur mustard
  - 1,390 metric tons of precursor chemicals
  - 3,563 unloaded chemical weapons munitions (aerial bombs)
  - 3 chemical weapons production facilities
- Since declaring this stockpile, Libya has destroyed under OPCW verification:
  - 55% of its sulfur mustard stockpile
  - 40% of its precursor chemicals, and
  - 100% of its unloaded CW munitions.

# Syria Chemical Weapons

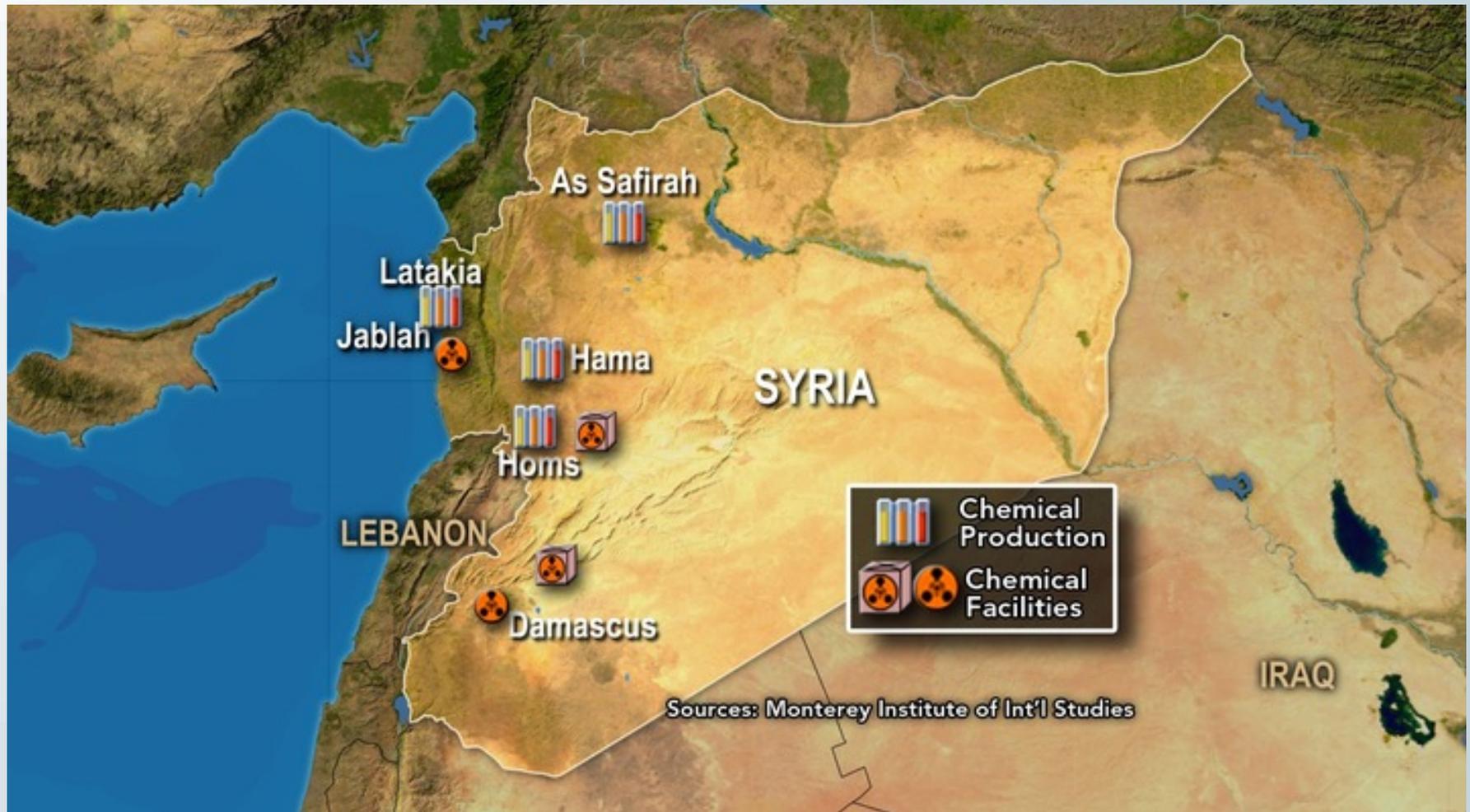
- Syria is one of only eight Chemical Weapons Convention non-member states.
- Thought to have large amounts of sarin, mustard gas, and possibly VX.
- Has both production and delivery capabilities
- Estimated 50 chemical weapons facilities and production sites
- Blister and nerve agents can be added to Scud missiles

<http://security.blogs.cnn.com/2012/12/03/source-syria-preparing-chemical-weapons/>

*Al-Safir chemical warfare complex (right, marked in green) and the Kafr Aakkar missile base (left, marked in light blue). A SAM-2 missile is seen on the far right (marked in red)*



# Syria Chemical Weapons – July 2012



# Syria Chemical Weapons

- Assistance and knowledge from the Soviet Union (and later Russia), Egypt, West Germany, France, Iran, North Korea, and possibly other countries



- Deterrent against Israel's assumed nuclear capability
- Insurance policy against potential domestic threats

# Scenarios for Syrian use of CW

- Deliberate use by the regime against civilians, rebels, Israel, or U.S. interests in the region
- Unauthorized use by radical generals or army units under fire
- Transfer to other countries or sub-state actors, e.g. Iran or Hezbollah
- Loss of control to terrorist groups, e.g. al Qaeda
- Rebel attacks on sites
- Rebel seizure of sites

[http://mideast.foreignpolicy.com/posts/2012/03/13/assads\\_toxic\\_assets](http://mideast.foreignpolicy.com/posts/2012/03/13/assads_toxic_assets)

# Syrian Missile Capability

- **Scud** missiles are tactical ballistic missiles developed by the Soviet Union during the Cold War and distributed widely to other countries. - **all capable of carrying chemical warheads**
- Designed for short-range battlefield use.
- Usually mobile to ensure survivability and quick deployment
- Scud-B, Scud-C, Scud-D, Hwasong-6, Rodong-1
- The Scud-D, with a range of 700 km and an advanced guidance system, is Syria's most advanced confirmed missile.



# Missiles in Syria

**OTR-21 *Tochka*** is a Soviet short-range tactical ballistic missile. Its NATO reporting name is **SS-21 *Scarab***. It is transported in a 9P129 vehicle, then erected vertically prior to launch.



# Syria's Position on CW

- After reading a statement in Arabic at a July 23, 2012 press conference, Syrian Foreign Ministry spokesman Jihad Makdissi said in English: *“Any stocks of WMD or any unconventional weapons that the Syrian Arab Republic possess would never be used against civilian, or against the Syrian people during this crisis at any circumstances.... All the stocks of the weapon that the Syrian Arab Republic possess are monitored and guarded by the Syrian army.”*
- Later in the press conference...*“Any stocks of any unconventional weapon, any chemical weapon, if it exists, it won't be used—never, ever—against civilian, against the Syrian people.”*
- According to the Associated Press, the Syrian government subsequently sent a statement to journalists, saying that *“all of these types of weapons—IF ANY—are in storage and under security.”*

# Syria CW and the U.S.

- At an Aug. 20, 2012 press conference, Obama said “*at this point*” he has “*not ordered military engagement,*” but emphasized that “[w]e cannot have a situation where chemical or biological weapons are falling into the hands of the wrong people.”
- He said the United States “*has communicated in no uncertain terms with every player in the region that that’s a redline for us and that there would be enormous consequences if we start seeing movement on the chemical weapons front or the use of chemical weapons. That would change my calculations significantly.*”

thecable.foreignpolicy.com

1/15/13

- [Exclusive: Secret State Department cable: Chemical weapons used in Syria](#)
- *United States diplomats in Turkey conducted a previously undisclosed, intensive investigation into claims that Syrian President **Bashar al-Assad** used chemical weapons, and made what an Obama administration official who reviewed the cable called a "compelling case" that Assad's military forces had used a deadly form of poison gas.*
- *The cable, signed by the [U.S. consul general in Istanbul, Scott Frederic Kilner](#), and sent to State Department headquarters in Washington last week, outlined the [http://thecable.foreignpolicy.com/posts/2013/01/15/secret\\_state\\_department\\_cable\\_chemical\\_weapons\\_used\\_in\\_syria](http://thecable.foreignpolicy.com/posts/2013/01/15/secret_state_department_cable_chemical_weapons_used_in_syria) results of the consulate's investigation into reports from inside Syria that chemical weapons had been used in the*