ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

"The importance of science in the implementation of the CWC"

Royal Society of Chemistry

Keynote speech by the Director-General of the OPCW

Ambassador Ahmet Üzümcü

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REMARKS AS DELIVERED

Professor Sir John Holman, President of the Royal Society of Chemistry
Distinguished members of the Society,
Dear Guests,
Ladies and gentlemen,

It is a pleasure and once again an honour to be addressing the Royal Society of Chemistry. I must express my gratitude to President, Professor Sir John Holman, for inviting me to speak before you. The support of the Society for the Chemical Weapons Convention (CWC) stretches back to its negotiation. It is heartening to be among some of its strongest champions in the scientific community.

This event is a poignant and timely one for me. The last occasion that I visited Burlington House was in March of 2011. I had been asked to come to London to give a presentation at an event hosted by the Society in conjunction with the Foreign and Commonwealth Office as part of the International Year of Chemistry.

At that time, I had been the Director-General of the Organisation for the Prohibition of Chemical Weapons (OPCW) for less than twelve months. Today, seven years later, my tenure as Director-General will end in almost two months exactly. *Tempus fugit* – time flies.

And much has changed at the OPCW and across the world itself over that period. Since that spring day, the Organisation has achieved great progress in eliminating chemical weapons stockpiles, won recognition for its efforts, marked a number of important milestones, and found

itself facing a series of challenges unforeseen at the time of entry-into-force of the CWC – challenges that I should point out continue to test the Organisation. But chemists and chemistry have been an integral part of the OPCW's mission and its response to these challenges. For example, the scientific community, including the RSC has reacted swiftly by condemning the uses of toxic chemicals as weapons in Syria and elsewhere.

Ladies and gentlemen,

Looking back, the accomplishments of the OPCW have been astonishing. Yet, I must underline that one thing persists: we are still very much threatened by chemical weapons and far more needs to be done.

After 21 years of sustained efforts in the area of chemical disarmament, we stand at the threshold of the complete destruction of declared global stockpiles. In 2011, I informed the Society that 63% of those stockpiles had been destroyed. That figure today has risen to over 96%, and we will attain 100% when the United States concludes its chemical demilitarisation process by its planned deadline of 2023.

Without the input of chemistry, however, this feat would have been impossible.
The CWC obliges its States Parties to not only destroy their stockpiles, but to also do it in a safe and environmentally-responsible manner. It took chemists and chemical engineers to devise the suitable hydrolysis methods and incineration to safely dispose of vast stocks of toxic agents.

The CWC is more than just a disarmament treaty. It is a comprehensive, international commitment undertaken by the states of the world to never again use or threaten to use chemical weapons against one another or their own citizens. Such a commitment can only be effective with the widest possible support.

For that reason, our universalisation activities have been a high priority. And they have accomplished results. 192 countries are now under the protection of the Convention, making it the most successful treaty of its kind.

The protection that the CWC provides is supported by one of the most far-reaching verification regimes ever devised for a disarmament treaty. At any given moment a team of OPCW inspectors is somewhere in the world walking through a chemical facility, including commercial sites, checking that prohibited activities are not taking place. Our close dialogue with chemical industry has been invaluable in ensuring the effectiveness of the regime without causing undue interference in chemical trade and commerce.

Again, without the input of chemistry, our efforts to monitor industrial activity would be ineffectual. In order for our inspectors to carry out their duties they need chemical engineering skills and a deep knowledge of chemical synthesis.

While much of the OPCW's work has occurred outside the public spotlight, it has nonetheless been recognised. In 2013, the OPCW received its highest tribute yet, when it was awarded the Nobel Peace Prize for its extensive efforts to eliminate chemical weapons.

Along the way, however, the Organisation has had to face significant challenges. Amongst these, our activities in the Syrian Arab Republic have and continue to be our biggest to date.

As I stood before the Society seven years ago, the unrest in Syria had just begun. No one imagined that it would soon transform into a full-scale civil war, and one in which chemical weapons would be used with such frequency.

In 2013, a barbaric sarin-gas attack on civilians in the Damascus suburb of Ghouta killed over 1,400 people. A UN-led mission that included OPCW inspectors was already on the ground in Syria at the time of the attack and was able to confirm the use of sarin. The international community was rightfully outraged.

After a framework agreement was reached between the United States and Russia, the Syrian Arab Republic acquiesced to dismantling its chemical weapons programme and joining the CWC.

Subsequent to Syria's accession to the Convention, the OPCW in cooperation with the United Nations was tasked in September 2013 with verifying the full removal, transportation, and destruction of Syria's declared chemical weapons within one year. This was an unprecedented and ambitious mission for the OPCW.
We had never overseen a chemical demilitarisation process in such a short timeframe and in the midst of a civil war.

Partnership was crucial to this mission and we received assistance – both financial and in-kind – from thirty OPCW Member States and the European Union. As a result of this overwhelming display of international cooperation some 1,300 metric tonnes of chemical warfare agents and their precursors were destroyed.

This should have been the end of our activities in Syria, yet it was just the beginning. In April 2014, under my own authority, I established a Fact-Finding Mission to determine the credibility of the persistent allegations of the use of toxic chemicals as weapons.

Over the past four years the FFM, as we refer to it, has conducted investigations into over 80 suspected attacks and has noted 14 likely or confirmed uses of chemical weapons in Syria. The FFM's most recent deployment was to the city of Douma, where it finished its onsite collection of samples three weeks ago.

In Libya the OPCW has had to tackle a different kind of issue. At the start of 2016, the Government of Libya informed the Organisation that it needed assistance to destroy the last remaining components of its chemical weapons programme. This consisted of some 500 tonnes of chemical weapon agent and precursors located in an unstable region of the country.

Again, an exceptional level of cooperation from twelve States Parties, including the United Kingdom, in conjunction with the OPCW saw the removal of these chemicals from Libya and transportation to Germany for final disposal.

The OPCW verified the complete destruction of these chemicals at a facility in Munster late last year.

Ladies and gentlemen,

Today, the OPCW continues to face significant challenges. Indeed, the focus on the Organisation has arguably never been greater. And yet, despite being the centre of certain political issues, the OPCW is still a technical organisation that is essentially founded upon, as well as guided and inspired by, chemistry. While our mandates and the methods that we employ may change with the unique circumstances of a given mission, the fundamental scientific principles upon which we base our analysis and conclusions is unchanged.

Our recent technical assistance visit here in the United Kingdom is a prime example of how analytical chemistry is placed at the front and centre of our work. After it was reported on 4 March that a suspected nerve agent had been used in Salisbury, the British government requested technical assistance from the OPCW. In response, a team of experts were dispatched from The Hague to provide support.

Environmental samples were collected from suspected contaminated sites and blood samples taken from the three main victims. Additionally, our experts examined the British authorities' data and the results of their chemical analysis.
The samples collected under full chain of custody were then brought back to the Netherlands for analysis at four designated laboratories. When the Secretariat concluded its work, the results determined the identity of the toxic chemical used in Salisbury in agreement with the findings of the UK.

In Salisbury, given the politically sensitive nature of the situation, there was a need for international validation of the identity of the toxic chemical determined by the British authorities. The designated laboratories were crucial for ensuring that the analytical results were irrefutable.

Independent validation of the results of the analysis is of the utmost importance under these circumstances. Collaboration between the laboratories to develop robust analysis methods is vital, such that two laboratories can run their analyses separately on the same samples and identify and confirm the same chemicals. Accordingly, the OPCW's network of designated laboratories is the linchpin of the Organisation's capacity to investigate suspected chemical weapons use.

Through their independent and impartial analysis of chemical samples collected by OPCW inspectors, the designated laboratories offer the necessary assurances to the States Parties that the determinations reached by the Technical Secretariat are of the highest reliability.

Becoming a designated laboratory is no simple affair. All laboratories that wish to join our network must operate at the highest technical competency. The OPCW conducts Proficiency Tests on environmental and biomedical samples, and laboratories are designated for one or both types of sample.

This proficiency testing scheme has been facilitated by the OPCW Laboratory in close cooperation with its partner laboratories over the past 24 years, beginning before the entry-into-force of the Convention.

It is not enough, however, to just pass this test. Participating laboratories must perform well in proficiency tests on a yearly basis to maintain designation.
Only a single reporting error is allowed out of three consecutive tests, and a false positive will result in immediate loss of designation.

There are currently 26 laboratories located across the 19 countries in the network. This includes the Defence Science and Technology Laboratory in Porton Down – the laboratory that conducted the initial chemical analysis of the Salisbury samples that the OPCW was requested to confirm.

Even with 26 laboratories, the OPCW is seeking to expand its network, particularly in the regions that possess no such laboratories. There is a noticeable absence of designated laboratories in Africa and Latin America. To address these gaps, the OPCW has been trying to build capacity in these regions through analytical chemistry training courses aimed to develop the specific skills required to perform well in the OPCW proficiency tests. Promoting chemistry is a means to enhance overall scientific literacy, and to support another of the norms of the CWC – to contribute to the economic and technological development of all States Parties.

In this connection, I have initiated a project to upgrade the OPCW Laboratory to a Centre of Chemistry and Technology.

This would enable the Laboratory to increase its capabilities to better facilitate proficiency testing and confidence building exercises, support contingency operations such as the FFM, and to expand and strengthen the designated laboratory network. The Centre of Chemistry and Technology that we envision would also have research capabilities to allow greater engagement with the broader scientific community as well as additional training possibilities for experts from States Parties.

International cooperation based on scientific collaboration is vital to ensuring that developing States Parties can enjoy the benefits of the peaceful uses of chemistry. The OPCW facilitates a number of capacity-building programmes to promote chemistry for peace. These include grants for research projects, conference support programmes, and laboratory training. All these programmes make use of science diplomacy to build trust between nations.

Ladies and gentlemen,

It is an often-repeated truism that science is advancing at an ever-increasing pace. Significant breakthroughs like the detection of gravitation waves, development of quantum computing, and the growing applications of gene-editing tools have greatly expanded our knowledge in the fields of physics, information technology, and biotechnology respectively.

The science of chemistry is also seeing advances, many of which are enabled by advances in other fields of science. And while we should encourage scientific progress, it is incumbent upon us to acknowledge the challenges it raises.

The OPCW has at its disposal an active Scientific Advisory Board (SAB). This is an independent advisory body that provides scientific and technical advice to help the organisation navigate the dynamic and evolving scientific landscape of the Twenty-First Century. This Board provides the OPCW with insight and practical advice on science – not from a perspective of fear, but from a viewpoint that as science moves forward, the organisation must move with it.

Taking this approach allows the OPCW to seize the opportunities of advancement to mitigate and overcome the challenges that new science and technology might bring for those seeking to harness it for harm. As the world moves closer to the complete eradication of chemical weapons, the success of the Organisation will cease to be quantified in weapons destroyed but in weapons prevented – a wholly different calculus. Here it is paramount that the OPCW remains ahead of the existing challenges, but also in touch with those on the horizon.

The SAB gives the OPCW this edge, and it has been instrumental in ensuring that the OPCW and its States Parties have adequate access to critical scientific information and knowledge to strengthen decision making. The SAB helps the OPCW keep abreast of new developments that could have an impact on the implementation of the CWC, as well as those that can enhance its capabilities for verification.

Irrespective of the necessity to be aware of what may come, I should point out that the chemistry which has been the focus of many OPCW missions is not the result of new scientific discoveries.

Take for example, sulphur mustard, which is still being used to this day as a warfare agent. This chemical was first produced using what we now refer to as the Levinstein process, which was devised in the nineteenth century. Still, even here modern science can help us deal with old science. Chemical analysis of sulphur mustard can determine the specific method of production, assisting investigators in identifying its likely source.

Yet, even modern science, despite all of its advances for the study of life processes, has been so far unable to identify the mechanism through which this chemical weapon causes blistering. Such a gap in our knowledge has prevented the development of medical countermeasures.

Then there is chlorine. First discovered in 1774 and given its name in 1810 by British chemist Humphry Davy. Chlorine has the dubious distinction of being the first chemical to be deployed as a weapon on an industrial scale in the First World War. Regrettably it is still being used as a weapon today in Syria. Investigations of the use of chlorine as a weapon pose great challenges for the use of chemical analysis to definitively identify exposure since the element chlorine is ubiquitous. There is also a lack of validated methods to retrospectively identify markers of exposure in environmental and biomedical samples.

The SAB helps us reach out into scientific communities where we can draw on existing knowledge and learn from the experiences of others to solve the problems we face. The Board is

wise and has taught us that we cannot focus on chemistry alone, for if we do we risk being blind to developments in other areas of science applicable to chemistry.

Remote sensing technology, artificial intelligence, and unmanned aerial systems, may ostensibly appear to have little relevance to preventing the re-emergence of chemical weapons. Nonetheless, they have been identified within the deliberations of the SAB as emerging technologies that could augment the tools currently available to inspectors.

It has been pointed out that they could improve the OPCW's capabilities to retrospectively identify chemical exposure, collect samples through identifying signatures of exposure and automated capabilities, and to minimise risks to inspectors working in hazardous environments.

Ladies and gentlemen,

Looking across the past and present activities of the OPCW, chemistry and chemists have been indispensable to the Organisation. The support of the scientific community has exemplified the values underlying the OPCW's motto: "working together for a world free of chemical weapons." Here I should acknowledge that I was inspired by the RSC's motto "Pro scientia et humanitate (for the sake of knowledge and for the benefit of humankind)" to initiate a process to formulate a motto for the OPCW in 2011.

As the Organisation increasingly finds itself moving into a post-destruction era, the need for science and scientists to support the CWC and its norms will only intensify. New scientific discoveries have the potential to both complicate and assist the mission of the OPCW and we cannot, nor should we want to, stifle and restrict innovation. We must recognise where new science can help fulfil our mission of a world free of chemical weapons. Looking to the Royal Society of Chemistry and other learned scientific societies, we rely upon your insights, advice, and contributions to ensure science is a force for human benefit that works to make the world a better place

Thank you for your attention.

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