



**REPORT OF THE TWENTY-FIRST SESSION
OF THE SCIENTIFIC ADVISORY BOARD**

1. AGENDA ITEM ONE – Opening of the session

- 1.1 The Scientific Advisory Board (SAB) met for its Twenty-First Session from 23 to 27 June 2014 at the OPCW Headquarters in The Hague, the Netherlands.
- 1.2 The session was opened and chaired by Professor Alejandra Graciela Suárez and vice-chaired by Dr Christopher Timperley.

2. AGENDA ITEM TWO – Adoption of the agenda

The SAB adopted the following agenda for its Twenty-First Session:

- 1. Opening of the session
- 2. Adoption of the agenda
- 3. *Tour de table* to introduce Scientific Advisory Board members
- 4. Welcome address by the Acting Director-General
- 5. Overview of developments at the OPCW since the last session of the Scientific Advisory Board
- 6. Establishment of a drafting committee
- 7. Developments in science and technology
 - (a) Temporary working group on convergence of chemistry and biology
 - (b) Technology foresight: a perspective from the International Atomic Energy Agency
 - (c) Monitoring developments in science and technology
- 8. Scientific and technological elements of verification technologies, emerging technologies and new equipment
 - (a) Temporary working group on verification
 - (b) Riot control agents



9. Further scientific and technological advice relevant to the Convention
 - (a) Temporary working group on education and outreach on science and technology
 - (b) Outreach activities of the Secretariat
 - (c) Outreach activities of other entities
 - (d) Outreach activities by members of the SAB
 - (e) Assistance and protection: medical countermeasures and treatment for blister and nerve agents
 - (f) Decontaminants
10. Scheduled chemicals and advice on the Annex on Chemicals
11. Visit to Museon and the OPCW Laboratory and Equipment Store in Rijswijk
12. Future work of the Scientific Advisory Board
13. Any other business
14. Adoption of the report
15. Closure of the session

3. AGENDA ITEM THREE – *Tour de table* to introduce Scientific Advisory Board members

A *tour de table* was undertaken to introduce the SAB members. Five new members, Dr Veronica Borrett (Australia), Dr Syed Raza (India), Mr Valentin Rubaylo (Russian Federation), Dr Koji Takeuchi (Japan), and Mr Cheng Tang (China), attended their first session of the SAB. A list of participants is contained in Annex 1.

4. AGENDA ITEM FOUR – Welcome address by the Acting Director-General

- 4.1 John Sequeira, the Acting Director-General of the OPCW, welcomed the SAB members to the Twenty-First Session of the Board. He noted that in the past year the OPCW had seen momentous developments that had thrust the Organisation into the international spotlight. These included: the Third Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention (hereinafter “the Third Review Conference”); the contribution to a United Nations investigation that confirmed the use of chemical weapons; the accession of the Syrian Arab Republic to the Chemical Weapons Convention (hereinafter “the Convention”) as the 190th State Party; the award of the Nobel Peace Prize to the OPCW for its “extensive efforts to eliminate chemical weapons”; and activities to verify the destruction of chemical weapons.
- 4.2 The identification of chemical agents by analysis of environmental and biomedical samples in last year’s investigation had drawn upon advice from the SAB.

Mr Sequeira thanked current and previous SAB members for their contributions to ensuring the readiness of the OPCW to respond to unexpected and unprecedented situations, and said that with these sorts of challenges, alongside new and emerging ones, the work of the SAB is ever more crucial to maintaining credible and effective verification.

- 4.3 In its follow-up to the Third Review Conference, the Technical Secretariat (hereinafter “the Secretariat”) will engage States Parties with a series of workshops intended to introduce science and technology to non-technical stakeholders, and to implement recommendations that the SAB and the Director-General made to the Third Review Conference.
- 4.4 On behalf of the Director-General, Mr Sequeira welcomed the five new members of the SAB by name.
- 4.5 He also thanked the members of the three temporary working groups (TWGs) and the Chairpersons: Professor Djafer Benachour (education and outreach in science and technology), Mr William Kane (convergence of chemistry and biology), and Professor Roberto Martínez-Álvarez (verification). The TWG on convergence of chemistry and biology had held its final meeting: the Secretariat will publish and disseminate the final report, and the Director-General will consider the recommendations. Such reports add insight to the collective body of scientific knowledge that pertains to implementation of the Convention. This report is the first of its kind and serves as a template for the reports that will arise from the SAB’s work on education and outreach and verification as the respective TWGs reach their end.
- 4.6 Mr Sequeira expressed appreciation for the recommendations that the SAB had provided on assistance and protection and on riot control agents earlier this year. The Secretariat had made the relevant advice available to Member States.
- 4.7 Finally, Mr Sequeira recognised the contributions to the SAB Trust Fund by the Governments of Australia and the United Kingdom of Great Britain and Northern Ireland. These contributions in particular enable the holding of meetings of the TWGs.

5. AGENDA ITEM FIVE – Overview of developments at the OPCW since the last session of the Scientific Advisory Board

- 5.1 The Secretary of the SAB, Stian Holen, reviewed developments at the OPCW since the SAB’s Twentieth Session. His presentation emphasised that science and technology underpin many Articles of the Convention and the future of the OPCW. He recalled the prominence given to science and technology and the SAB at the Third Review Conference, and summarised the work of the Secretariat to implement the recommendations made by the SAB and the Director-General to the Third Review Conference. The activities related to the investigation of alleged use in 2013 had demonstrated the value of scientific advice, notably on chemical analysis.
- 5.2 The Secretary informed the SAB of the progress of informal consultations among States Parties on issues related to the chemical industry (such as transfer discrepancies and refinements to inspections). He also updated the SAB members on the overall

status of the destruction of chemical weapons and the investigations of alleged use of chemical weapons in the Syrian Arab Republic.

- 5.3 The Secretary described past and planned activities by the Secretariat and the SAB in engaging with States Parties and other stakeholders to the Convention. This included briefings by SAB members in the margins of sessions of the Executive Council and the Conference of the States Parties, side events in the margins of the Meeting of Experts and the Meeting of States Parties of the Biological Weapons Convention (BWC), and participation in relevant scientific conferences.

6. AGENDA ITEM SIX – Establishment of a drafting committee

The SAB established a drafting committee to prepare the draft report of its Twenty-First Session.

7. AGENDA ITEM SEVEN – Developments in science and technology

Subitem 7(a): Temporary working group on convergence of chemistry and biology

- 7.1 The Chairperson of the TWG on the convergence of chemistry and biology, William Kane, summarised its final report, highlighting the key findings and recommendations from the work of the TWG in its meetings from 2011 through to its final meeting in 2013.
- 7.2 The TWG observed that advances in bio-mediated processes and their commercial applications were increasing at a rapid pace. Enabling technologies such as high-speed computing and high-throughput screening are being used more routinely to speed up research and development. Additionally, the use of multidisciplinary teams (with expertise in chemistry, biology, engineering, physics, mathematics, computer science, etc.) has become more common—when teamwork is combined with enabling technologies, more can be accomplished with fewer human resources in a shorter time.
- 7.3 The TWG studied the biotechnology industry and commercialisation trends. High-yield bio-mediated production processes are being developed and commercialised for large-scale production of chemicals. Industry is using advanced fermentation methods and engineered enzymes to convert biomass feedstocks to basic and fine chemicals.
- 7.4 The increasing use of bio-mediated production processes has implications for the verification regime under the Convention. The TWG has reviewed the meaning of the term “produced by synthesis” as it applies to Part IX of the Verification Annex to the Convention (hereinafter “the Verification Annex”), in the context of declarations required for other chemical production facilities (OCPFs). The TWG has stated that any process designed for the formation of a chemical substance should be covered by the term “produced by synthesis”. This statement was endorsed at the Twentieth Session of the SAB. Further assessment of the new bio-based production facilities is needed to determine the degree of relevance to the object and purpose of the Convention.

- 7.5 The capability to produce toxic chemicals, scheduled chemicals, toxins, and bioregulators using a biological process was explored in detail by the TWG and the findings are included in its final report. The TWG concluded that, for classical chemical warfare agents, such as nerve agents and blister agents, there is currently no known advantage in trying to produce such chemicals through biological means.
- 7.6 The convergence of chemistry and biology is providing major benefits to humankind, particularly in health care, alternative energy sources, and environmental control. Combined with other advances, particularly in nanotechnology, it is also being exploited in the development of improved defensive countermeasures against chemical and biological warfare agents that will have implications for verification, and for assistance and protection. There have been beneficial developments in protective clothing and equipment, decontamination, verification, detection/diagnostics, and medical countermeasures.
- 7.7 Recommendations to the Director-General were included in the final report. The rapid pace of the convergence of chemistry and biology highlighted the need to further monitor advances in biotechnology and related commercial developments. The report emphasised that it will be important to establish contacts with the biotech industry and engage subject matter experts on a regular basis—as is now the case with the chemical industry. Because of the successful collaboration with a BWC staff member in the TWG, a structured approach to maintaining contacts with the BWC community was recommended.
- 7.8 The SAB endorsed the report from the fourth meeting of the TWG on convergence, as published in SAB-21/WP.2 (dated 25 November 2013)¹ and the final report of the TWG, which will be formally released through the OPCW website in July 2014.
- 7.9 In the subsequent discussion, the following points were raised:
- (a) The complexity and the inter-disciplinary nature of the subject matter highlight the need to engage scientists, National Authorities, and policy-makers. Convergence should be considered a topic for education and outreach;
 - (b) The rapid advances arising from convergence across the sciences underlines the importance of ensuring that the Secretariat keeps abreast of developments in science and technology;
 - (c) The recent trends in translational research are compressing the time frames required for basic discoveries to become usable applications; and
 - (d) The convergence of the sciences has led to new methodologies for producing chemicals through biological means. Such developments may require the expansion of analytical tools useful for verification.
- 7.10 The work of the TWG on convergence has been recognised across many different communities of stakeholders. The Spiez Laboratory (Switzerland) will organise a series of workshops on convergence of the sciences; the first workshop is to take

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www.opcw.org/index.php?eID=dam_frontend_push&docID=16880

place on 6 to 9 October 2014. This event will bring scientists and policy-makers together to discuss the implications arising from developments in the convergence of chemistry and biology. Members of the SAB and Secretariat staff have been invited.

Subitem 7(b): Technology foresight: a perspective from the International Atomic Energy Agency

- 7.11 Dimitri Finker (guest speaker) from the Division of Technical and Scientific Services of the International Atomic Energy Agency (IAEA) presented the role and mission of the IAEA, focusing on its mandate for the verification of the non-proliferation treaty. Mr Finker explained that the IAEA verification of the correctness and completeness of State declarations is based on analysis of information provided by the State, open-source literature and commercial satellite imagery, and field activities conducted by IAEA inspectors. Field activities may involve instrumentation operated by inspectors and installed at facilities running in unattended or remote mode. Diverse techniques are implemented to verify multiple parameters associated with State declarations, including optical surveillance, sealing, and radiation detection (e.g. neutron coincidence counting and gamma spectrometry).
- 7.12 The IAEA has recognised and articulated the need to take full advantage of advances made outside the safeguards community to strengthen verification activities in a less costly and more sustainable manner. The IAEA has implemented a technology foresight initiative to systematise and accelerate the adoption of new safeguards technologies.
- 7.13 The SAB thanked Mr Finker for his informative presentation. In the subsequent discussion, the following comments were made:
- (a) In IAEA verification, all available information (including satellite images and validated publicly available information) can be utilised;
 - (b) Adoption of new technology in the IAEA is critical and requires constant user feedback during development to ensure that it meets capability requirements; and
 - (c) Open innovation is a valuable approach for sourcing new technologies.

Subitem 7(c): Monitoring developments in science and technology

- 7.14 Jonathan Forman (from the Secretariat) updated the SAB on the Secretariat's activities to keep abreast of relevant developments in science and technology, and presented observations and highlights from this work. A key observation is that technology development through multidisciplinary approaches is commonplace and must be taken into account; the technologies that have been enabling advances in the chemical and biological sciences are coming from other disciplines and may not be immediately recognised if monitoring is limited to chemical-specific information. Information and communication technologies are a key aspect of new scientific development; examples of the integration of these technologies with chemical, spatial, and temporal data collection methodologies were discussed. Examples of similar technologies that have been translated into consumer products were also highlighted, demonstrating the significant reduction in cost and improved robustness of many new

technologies. The Secretariat should be actively engaging with scientific experts from a range of disciplines and using scientific social media to remain connected with the broader community of experts; the use of crowd-sourcing strategies was proposed to bring information to the Secretariat and engage with external stakeholders (in order to benefit both science and technology monitoring, and education and outreach objectives).

7.15 In the subsequent discussion, the following points were made:

- (a) The number of reports published daily on new science and technology is overwhelming. It is not possible to identify and examine all of the relevant information without specialised software tools, and even with these, expert evaluation is still required;
- (b) Technology indicators are helpful in identifying trends and providing summary statistics, but there are challenges in identifying and optimising relevant indicators;
- (c) Interaction with the scientific community is critical for science and technology monitoring. Personal interactions and presence at key meetings provide the greatest insights into how new science and technology is evolving. Keeping active in scientific networks both in person and through online communication is important for keeping abreast of new developments; and
- (d) The SAB considers that much benefit could be gained by the Secretariat's acquisition of more sophisticated data-mining and analytical tools and expertise for monitoring advances in science and technology relevant to the Convention. This would be the most sustainable approach to this complex task.

8. AGENDA ITEM EIGHT – Scientific and technological elements of verification technologies, emerging technologies and new equipment

Subitem 8(a): Temporary working group on verification

- 8.1 The Chairperson of the TWG on verification, Roberto Martínez-Álvarez, presented the work from its second and third meetings (held from 23 to 25 September 2013 and 7 to 9 April 2014 respectively), and the ongoing intersessional work of the TWG.
- 8.2 Continuing its work to understand the experiences of other international organisations, the TWG invited guest speakers from the World Health Organization (WHO), the IAEA, the Organization for Economic Co-operation and Development, (OECD) and the Vienna Center for Disarmament and Non-Proliferation (VCDNP). The members of the TWG discussed sampling and analysis (S&A), new and existing software tools for the management of information, and science and technology monitoring. The TWG is also considering the technical aspects of the meaning of “produced by synthesis” as it is used in the definition of a discrete organic chemical. The TWG interviewed members of the Secretariat and is assessing the tools available to them and any gaps in their activities where new technologies might help improve efficiency.

- 8.3 With regard to S&A, the TWG had considered progress made in the attribution and analysis of biomedical samples and toxins. The TWG noted the need for adequate flexibility for handling and reporting on samples from investigations of alleged use.
- 8.4 Key points arising from the TWG meetings include the requirement for new tools for data handling, consideration of the use of publicly available information, and new commercially available technologies for data collection and imaging.
- 8.5 The SAB endorsed the reports from the second and third meetings of the TWG on verification: SAB-21/WP.1 (dated 25 September 2013)² and SAB-21/WP.6 (dated 9 April 2014)³. The next meeting of the TWG on verification will be held from 29 September to 1 October 2014 in The Hague.
- 8.6 In the subsequent discussion, the following points were raised:
- (a) The suitability of provisions of the Convention for adopting new verification tools was discussed. Remote monitoring tools are readily available and could be more fully utilised. There is potential for more efficient and lower-cost equipment to be used for verification. The SAB could assist in evaluating such tools and provide recommendations. Similarly, new technologies for communication and storing information could assist in streamlining routine practices; and
 - (b) A need for acceptance criteria on trace analysis was noted. Current protocols follow European Union guidelines, although broader sets of samples, such as environmental and biomedical, possibly resulting from an investigation of alleged use, could require further evaluation for validation of results.

Subitem 8(b): Riot control agents

- 8.7 Christopher Timperley summarised the response of the SAB to the Director-General's request for advice on riot control agents (RCAs). In accordance with subparagraph 1(e) of Article III of the Convention, States Parties are required to declare RCAs, which are defined in paragraph 7 of Article II of the Convention. At its Twentieth Session, in June 2013, the SAB was requested by the Director-General (Annex 4 of SAB-20/1, dated 14 June 2013) to provide technical advice on an initial list of RCAs that had been declared by States Parties or considered as RCAs.
- 8.8 The initial list developed by the Secretariat had been expanded from 44 to 59 chemicals using the Secretariat's criteria and the properties of these chemicals considered by review of previous SAB advice and the scientific literature. This allowed classification of each substance either as a toxic chemical defined by paragraph 2 of Article II, or as an RCA defined by paragraph 7 of Article II of the Convention. Only 17 chemicals met the definition of an RCA as defined by paragraph 7 of Article II. This advice provided by the SAB on the 17 chemicals that

² www.opcw.org/index.php?eID=dam_frontend_push&docID=16799

³ www.opcw.org/index.php?eID=dam_frontend_push&docID=17268

correspond to an RCA as defined by paragraph 7 of Article II of the Convention was published as a Note by the Secretariat (S/1177/2014, dated 1 May 2014)⁴.

9. AGENDA ITEM NINE – Further scientific and technological advice relevant to the Convention

Subitem 9(a): Temporary working group on education and outreach on science and technology

- 9.1 The Chairperson of the TWG on education and outreach, Djafer Benachour, reported on its third meeting, held from 26 to 29 November 2013, and on its intersessional work. The presentation focused on the main observations and recommendations made by the TWG members during that meeting. These included urging the Organisation, relevant stakeholders, and supporters to take full advantage of the education and outreach opportunities presented by the award of the Nobel Peace Prize in 2013. The TWG noted that Programme and Budget of the OPCW for 2014 (C-18/DEC.6, dated 4 December 2013) included funding for education and outreach activities, and welcomed the emphasis placed on education and outreach by the Third Review Conference.
- 9.2 The TWG expressed appreciation for the arrangements that the Secretariat has initiated with science and peace museums and proposed that the Secretariat, in cooperation with National Authorities, provides appropriate material to enable museums to incorporate Convention-related topics and responsible-use issues in their exhibits as appropriate. The participation of the OPCW in the annual conference of the European Network of Science Centres and Museums (ECSITE) in 2014 is an outcome of the work in the TWG on education and outreach.
- 9.3 The TWG reviewed educational materials for high-school chemistry students in a student workbook called “Chemistry in Conflict”. The workbook has three main sections (chemical weapons, the OPCW and the Convention, and ethics and science). The first draft of the workbook has now been prepared and it will be piloted in various school settings in the Netherlands and revised where necessary.
- 9.4 The TWG meeting was scheduled to coincide with the fifteenth annual meeting of National Authorities to help strengthen the interaction with States Parties. TWG members participated in two parallel interactive breakout sessions; one on education and outreach and the other on science and technology. The education and outreach session engaged the National Authorities to explore ways in which they can benefit from, and contribute to, enhanced education and outreach efforts; participants were also made aware of publicly available materials that they could obtain and use in their own outreach efforts. The science and technology session engaged the National Authorities to be more involved in understanding science and technology issues and how they may affect Convention implementation, even when the developments may not appear to have any direct impact; recommendations for improved communication and discussion of science and technology with non-technical stakeholders were discussed in the session. The conclusions and recommendations of the breakout group were presented in plenary to the National Authorities meeting. The TWG

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expressed its appreciation for the opportunity to interact again with the National Authorities. Given the emphasis put on education and outreach at the Third Review Conference and at the meetings National Authorities, the TWG proposes that education and outreach is made a standing agenda item for such meetings at both the global and regional levels. The TWG emphasised the need to work with international organisations such as the United Nations Education, Cultural and Scientific Organization (UNESCO), the International Union of Pure and Applied Chemistry (IUPAC), and the United Nations Interregional Crime and Justice Research Institute (UNICRI) to share and benefit from their education and outreach experiences, and to be part of their networks.

- 9.5 Professor Benachour also presented some outreach activities he had conducted in Algeria during the first semester of 2014: taking the opportunity of two national seminars, he presented an outline of the missions and activities relating to the OPCW, the Convention, the SAB, and the TWGs. He also gave some examples of cases where “an image is often worth a thousand words”, thus suggesting that the use of images could be an appropriate outreach tool.
- 9.6 The SAB endorsed the report from the third meeting of the TWG on education and outreach: SAB-21/WP.3 (dated 7 January 2014)⁵. The next meeting of the TWG on education and outreach would be held on 24 and 25 September in The Hague.
- 9.7 The SAB raised the question of integrating ethical issues into scientific curricula. The merits of incorporating such issues in a science course versus those of developing a separate course were discussed. Approaches that are customisable can be used to enhance current curricula and would present fewer challenges.

Subitem 9(b): Outreach activities of the Secretariat

- 9.8 Daniel Feakes (of the Secretariat) updated the SAB on OPCW activities in education and outreach since the last session of the Board, and informed participants about future planned activities. Mr Feakes presented practical examples of materials that the OPCW has produced in collaboration with various external partners, and which are mostly available for immediate use in educational settings. These include two short films about aspects of chemical warfare (available at www.thefiresproject.com), a workbook on the OPCW and the Convention aimed at high-school chemistry students, and an interactive web-based educational resource developed in collaboration with the IUPAC (available at <http://multiple.kcvs.ca/site/index.html>). Mr Feakes also referred to a series of events in which the Secretariat has participated, and to high-level statements and speeches that the Director-General has made, for example at the annual conference of a network of science centres and museums in May and at the EuroScience Open Forum in June. Future plans mentioned by Mr Feakes include the development of a portable exhibition on the OPCW in collaboration with the Nobel Peace Center, a conference in The Hague entitled “Education for Peace” on 22 and 23 September 2014 (S/1190/2014, dated

⁵ www.opcw.org/index.php?eID=dam_frontend_push&docID=17057

16 June 2014)⁶ and events to mark the centenary in April 2015 of the first large-scale use of chemical weapons.

- 9.9 The SAB was highly supportive of the education and outreach work of the Secretariat.

Subitem 9(c): Outreach activities of other entities

- 9.10 Professor Leiv Sydnes (guest speaker), Chairperson of the IUPAC Committee on Chemical Research Applied to World Needs (CHEMRAWN), presented an overview of the IUPAC, the cooperation between the IUPAC and OPCW, and areas of common interest between the two organisations. The IUPAC's mission is to advance the worldwide benefits of the chemical sciences and contribute to the application of chemistry in the service of humankind. As the IUPAC recognises the potential dangers of how chemistry could be misused, activities in education, outreach, and public understanding are important and represent a natural partnership for collaborative activities between the IUPAC and OPCW. These have included reports on the impact of advances in science and technology, the role of ethics and codes of conduct, and participation in workshops.
- 9.11 Professor Sydnes raised a series of questions regarding the provisions of the Convention and the impact of science and technology. Issues he raised included the issue of RCAs, informatics, chemical and biological analysis, manufacturing and processing of chemicals, new materials, nanotechnology, and the convergence of the sciences. He further discussed concerns that have been raised by the possible misuse of technologies produced by the integration of advances across these areas. Mechanisms for obtaining chemicals and the way chemicals are traded and transported were also highlighted as challenges in a globalised world.
- 9.12 Professor Sydnes suggested ways to overcome challenges in integrating Convention issues into education and to ensure that audiences are engaged when discussing this topic. He discussed approaches for producing educational materials that can be presented in appropriate ways to suit a given audience. Communication and public awareness of the benefits, safety aspects, and dual-use potential of chemicals was noted as being critically important. Striving for new and creative ways to communicate and present relevant information (which does not need to be the most high tech, but the most engaging) is important. He emphasised that the OPCW should play a significant role in these initiatives.
- 9.13 The SAB thanked Professor Sydnes for his informative presentation. In the subsequent discussion, the following comments were made:
- (a) Ethics and codes of conduct with respect to the Convention, particularly in the academic and industrial sectors, were discussed;
 - (b) Initiatives such as Responsible Care®, REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals), and SAICM (Strategic Approach to International Chemicals Management) are helping to reduce risks from

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toxic materials, but these regulations alone cannot replace the need for awareness raising of the safe use of chemicals;

- (c) A good practice suggested for awareness raising was to have discussions within target groups to consider a variety of materials and topics (adjusted to the audience interest); and
- (d) The SAB encouraged the Secretariat to continue its collaboration with the IUPAC.

9.14 Dr Bradley Miller (guest speaker), Director of the American Chemical Society (ACS) Office of International Activities, reviewed the origins, purposes, engagement models, and selected activities past and present of international affairs at the ACS. The ACS, a non-profit organisation, is the world's largest scientific society and one of the world's leading sources of authoritative scientific information. It was founded in 1876 and is chartered by the United States Congress. The forthcoming ACS national meeting in San Francisco in August 2014 is expected to bring 18,000 attendees to discuss 10,000 scientific papers. Dr Miller highlighted ACS programmes for overseas chapter development, alliances, symposia and workshops, science and human rights, community outreach, exchange, mobility, and research collaboration.

9.15 The SAB thanked Dr Miller for his informative presentation. In the subsequent discussion, the following comments were made:

- (a) Promoting the benefits of chemistry and recognising and raising awareness of the misuse of chemistry are common themes across the ACS, IUPAC, and the OPCW;
- (b) Participation by the African continent was noted as low in both the ACS and IUPAC. Both organisations are working with the African Federation of Chemical Societies to improve engagement; and
- (c) The SAB encouraged the Secretariat to augment its dialogue with national and regional chemistry societies and pursue opportunities for collaborative work.

Subitem 9(d): Outreach activities by members of the SAB

9.16 SAB members described outreach activities in which they were involved. These included:

- (a) training activities and participation in scientific conferences;
- (b) the award of the Nobel Peace Prize in 2013 has brought high visibility to the OPCW and many SAB members had been interviewed by the media in their home countries about the work of the Organisation; and
- (c) several members have been contacted by the media concerning public safety in activities involving the removal and destruction of chemical warfare agents and related precursors from the Syrian Arab Republic.

- 9.17 The SAB stands ready to provide scientific input for public information related to the safe handling and destruction of chemical agents and precursors if required by the Director-General.

Subitem 9(e): Assistance and protection: medical countermeasures and treatment for blister and nerve agents

- 9.18 Slavica Vučinić presented the findings of the report by the SAB in response to the request from the Director-General for advice on assistance and protection to the SAB at its Twentieth Session. The report recommends pretreatments and post-exposure treatments that are currently available for nerve agents. There is no standardised, optimal treatment method for sulfur mustard exposure, and the current therapeutic strategy is designed to relieve symptoms, prevent infection, and promote healing. Best practices from available literature are summarised in the report (SAB-21/WP.7, dated 29 April 2014)⁷. New developments in chemical warfare agent medical countermeasures and treatments will be monitored by the SAB and the Secretariat.
- 9.19 Members of the SAB noted that the compilation of the information in the report could be a valuable reference for medical professionals and emergency responders who may not have knowledge of symptoms and treatment options related to exposure to chemical warfare agents. Translation of the report into other languages was recommended.
- 9.20 Mr Shawn DeCaluwe (of the Secretariat) briefed the SAB on how its report on assistance and protection was being implemented by the OPCW and how the information it contained benefited the International Support Network for Victims of Chemical Weapons. Jonathan Forman introduced some work reported in the scientific literature on countermeasures for organophosphorus nerve agents that may reduce the risks of longer-term neurological damage. In light of ongoing research and new insights, the Director-General (see Annex 2) requested the SAB to:
- (a) identify best practices for preventing and treating the health effects that arise from acute, prolonged, and repeated organophosphorus nerve agent exposure; and
 - (b) identify any emerging medical countermeasures, intended for use at the point of exposure, that can reduce or eliminate longer-term health effects arising from acute, prolonged, and repeated exposure.
- 9.21 The SAB formed a correspondence group that would provide advice related to countermeasures and treatments for organophosphorus nerve agents, as requested. Slavica Vučinić will lead this correspondence group, and the SAB seeks to report to the Director-General by the end of February 2015.

Subitem 9(f): Decontaminants

- 9.22 Roberto Martínez-Álvarez described decontaminants currently in use for chemical warfare agents, such as bleaches and oxidising agents. He explained that

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decontamination to remove and detoxify chemical substances from people and equipment can be both a physical and chemical process. However, many decontaminants are toxic, corrosive, or damaging to clothing and electronics, requiring that both the chemical agent and decontaminants be rendered harmless. Decontamination must also be a fast process and there are ongoing efforts to identify new substances that are faster acting, cheaper, less toxic, and more environmentally friendly than today's most common decontaminating agents. The presentation provided an informative overview of the current methods used for traditional warfare agents and the future prospects for developing improved reagents.

- 9.23 The SAB noted that current best practices revolve around established decontaminants with the inherent drawbacks indicated in the presentation, and that there was great value in further research and development. New developments that have been demonstrated and deployed by armed forces are combinations of decontaminants and adsorbing materials.

10. AGENDA ITEM TEN – Scheduled chemicals and advice on the Annex on Chemicals

No discussion was scheduled for this topic at this session of the SAB.

11. AGENDA ITEM ELEVEN – Visit to Museon and the OPCW Laboratory and Equipment Store in Rijswijk

- 11.1 The SAB visited the Museon, an interactive museum of culture and science located in The Hague. The Museon is currently hosting an exhibition called “*Werken aan Vrede*” (“Give Peace a Chance”) on WMD⁸ disarmament, the Nobel Peace Prize, and the role of international organisations; the OPCW is featured as part of the display. The SAB was grateful to Friso Visser (Deputy Director of Museon) for providing a personalised tour. The visit allowed the SAB members to see the outcome of the work they have been supporting through the TWG on education and outreach in engaging with science museums to provide information about the OPCW and raise awareness of the Convention.

- 11.2 The SAB visited the OPCW Laboratory and Equipment Store in Rijswijk, where it was briefed on the purpose and work of the two units, notably: S&A (including on-site and off-site analysis, chemical as well as biomedical S&A, the OPCW Central Analytical Database, and the OPCW's contribution to the United Nations investigation of alleged use of chemical weapons), the network of designated laboratories and system of proficiency tests, and inspection equipment. The visit further augmented the SAB's appreciation of the practical aspects and the complexities of verification under the Convention.

12. AGENDA ITEM TWELVE – Future work of the Scientific Advisory Board

- 12.1 The SAB discussed its future work, both intersessional activities and the next session: the Board agreed to hold its Twenty-Second Session from 8 to 12 June 2015.

⁸ WMD = weapon(s) of mass destruction.

- 12.2 Bearing in mind the need to assess developments in science and technology and make recommendations to the Fourth Review Conference, the SAB sees the need to hold two sessions per year in 2016 and 2017. Furthermore, the SAB believes it is important to draw on a number of sources of insight for its assessment, and recommended that a series of focused technical workshops be held in the two to three years preceding the next Review Conference. The SAB asked the Secretariat to make available the necessary resources.
- 12.3 The SAB requested the SAB Secretary and the Science Policy Adviser of the Secretariat to develop a proposal for an action plan for monitoring developments in science and technology.

13. AGENDA ITEM THIRTEEN – Any other business

- 13.1 In the margins of this session, the SAB Chairperson and Vice-Chairperson continued their engagement with States Parties and on 26 June presented an overview of the activities of the SAB to delegates from twenty States Parties. The SAB welcomed the initiative by the Secretariat to engage delegates with a series of thematic workshops on science and technology, which represents tangible follow-up to the recommendations that the SAB had made to the Third Review Conference. An introductory presentation on this initiative was provided by Jonathan Forman.
- 13.2 Also in the margins of the SAB session, the SAB Chairperson and all TWG chairpersons held an informal discussion with Secretariat staff members. This would also continue.

14. AGENDA ITEM FOURTEEN – Adoption of the report

The SAB considered and adopted the report of its Twenty-First Session.

15. AGENDA ITEM FIFTEEN – Closure of the session

The Chairperson closed the session at 16:30 on 27 June 2014.

Annexes:

- Annex 1: List of Participants in the Twenty-First Session of the Scientific Advisory Board
- Annex 2: (English only) Director-General's request to the Scientific Advisory Board to Provide Further Advice on Assistance and Protection

Annex 1

**LIST OF PARTICIPANTS OF THE TWENTY-FIRST SESSION
OF THE SCIENTIFIC ADVISORY BOARD⁹**

	Participant	Institution
1.	Abdollahi, Mohammad	Tehran University of Medical Sciences, the Islamic Republic of Iran
2.	Baulig, Augustin	Secrétariat général de la défense et de la sécurité nationale, Paris, France
3.	Benachour, Djafer	LMPMP, Faculty of Technology, Ferhat Abbas University, Setif-1, Algeria
4.	Borrett, Veronica	General Manager Bio21 Molecular Science and Biotechnology Institute, University of Melbourne, Australia
5.	Cariño, Florida Arsciwals	Institute of Chemistry, University of the Philippines
6.	Mourão, Nícia Maria Fusaro	ABIQUIM (Brazilian Chemical Industry Association), São Paulo
7.	Geist, Michael	BASF SE, Ludwigshafen, Germany
8.	Gonzalez Berutti, David	Department of Chemistry, University of the Republic of Uruguay, Montevideo, Uruguay
9.	Kane, William	Consultant to Monsanto Company, Louisiana, United States of America
10.	Martínez-Álvarez, Roberto	Complutense University, Madrid, Spain
11.	Muhammad Zafar-Uz-Zaman	National Engineering and Scientific Commission (NESCOM), Islamabad, Pakistan
12.	Neffe, Slawomir	Military University of Technology, Warsaw, Poland
13.	Raza, Syed	Institute of Pesticide Formulation Technology (IPFT), India
14.	Rubaylo, Valentin	State Scientific Research Institute of Organic Chemistry and Technology, Russian Federation
15.	Suárez, Alejandra Graciela ¹⁰	Universidad Nacional de Rosario. Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina
16.	Takeuchi, Koji	National Institute of Advanced Industrial Science and Technology (AIST), Japan
17.	Tang, Cheng	Office for the Disposal of Japanese Abandoned Chemical Weapons, Ministry of National Defence, China
18.	Timperley, Christopher ¹¹	Defence Science and Technology Laboratory (Dstl), Porton Down, United Kingdom of Great Britain and Northern Ireland
19.	Trifirò, Ferruccio	Department of Industrial Chemistry, University of Bologna, Italy
20.	Vanninen, Paula	VERIFIN, Department of Chemistry, Faculty of Science, University of Helsinki, Finland

⁹ Abdullah Al-Amri did not attend the Twenty-First Session of the SAB.

¹⁰ Chairperson of the SAB.

¹¹ Vice-Chairperson of the SAB.

22.	Van Straten, Francois Mauritz	South African Nuclear Energy Corporation SOC Ltd, Pretoria, South Africa
21.	Vučinić, Slavica	National Poison Control Centre, Military Medical Academy, Belgrade, Serbia
23.	Zaitsev, Volodymyr	Taras Shevchenko National University of Kyiv, Ukraine
24.	Zina, Mongia Said	Faculty of Sciences of Tunis, Tunisia
25.	Finker, Dimitri (Guest Speaker)	Division of Technical and Scientific Services, International Atomic Energy Agency (IAEA)
26.	Miller, Bradley (Guest Speaker)	Office of International Affairs, American Chemical Society, United States of America
27.	Sydnes, Leiv (Guest Speaker)	University of Bergen, Norway and International Union of Pure and Applied Chemistry (IUPAC) Committee on Chemical Research Applied to World Needs (CHEMRAWN)

Annex 2

**DIRECTOR-GENERAL'S REQUEST TO THE SCIENTIFIC ADVISORY BOARD
TO PROVIDE FURTHER ADVICE ON ASSISTANCE AND PROTECTION**

1. At the Twentieth Session of the OPCW Scientific Advisory Board (SAB), the Director-General requested that the SAB provide further advice on assistance and protection against chemical weapons (see Annex 6 of SAB-20/1, dated 14 June 2013). The SAB completed its work and provided the Director-General with a report of their findings (see SAB-21/WP.7, dated 29 April 2014).
2. In light of recent events and victims of chemical weapons currently undergoing medical care, there is a compelling need to have a better understanding of what can be done to mitigate longer-term effects of chemical agent exposure. Such information would be a valuable addition to the International Support Network for Victims of Chemical Weapons (C-16/DEC.13).
3. The Director-General requests the Scientific Advisory Board to:
 - (a) identify best practices for preventing and treating the health effects that arise from acute, prolonged, and repeated organophosphorus nerve agent exposure; and
 - (b) identify any emerging medical countermeasures, intended for use at the point of exposure, that can reduce or eliminate longer-term health effects arising from acute, prolonged, and repeated exposure.

Technical Secretariat
June 2014

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