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NOTE BY THE DIRECTOR-GENERAL**THE IMPACT OF THE DEVELOPMENTS IN SCIENCE AND TECHNOLOGY
IN THE CONTEXT OF THE CHEMICAL WEAPONS CONVENTION**

1. This Note sets out the Director-General's views on the impact of developments in science and technology in the context of the Chemical Weapons Convention (hereinafter "the Convention") and includes comments on the report of the Twenty-Fifth Session of the Scientific Advisory Board (SAB) (SAB-25/1*, dated 31 March 2017).
2. An understanding of developments in science and technology is crucial to the full and effective implementation of the Convention, as scientific and technological underpinnings are found throughout its articles. The need for sound scientific expertise in chemical disarmament has never been greater, as exemplified by the work of the designated laboratories and the needs of the Technical Secretariat's (hereinafter "the Secretariat") contingency operations. Effectively preventing the re-emergence of chemical weapons and ensuring that the Organisation maintains its scientific literacy requires ever greater levels of science policymaker partnerships. In this regard, the SAB serves as a most valuable resource to bring practical scientific advice to policymakers.
3. As the SAB prepares its report and recommendations to the Fourth Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention (hereinafter "the Fourth Review Conference"), its workload has seen a significant increase along with consumption of funds available through the SAB trust fund. A call for voluntary contributions to support the work of the SAB was issued in January this year (S/1450/2017, dated 16 January 2017). The Director-General encourages States Parties to carefully consider this Note.
4. The Director-General would like to remind States Parties that seven members of the SAB will be leaving the Board in 2017, three in August and four at the end of the year. A formal call for nominations has been issued (S/1452/2017, dated 18 January 2017) with the deadline for submission of nominations set at 28 July 2017.

**RESPONSE TO THE REPORT OF THE TWENTY-FIFTH SESSION OF THE
SCIENTIFIC ADVISORY BOARD**

5. The SAB met in The Hague, the Netherlands, for its Twenty-Fifth Session from 26 to 30 March 2017. The session was chaired by Dr Christopher Timperley, with



Mr Cheng Tang as the Vice-Chairperson. The report of the session was issued as SAB-25/1*.

6. In his opening remarks,¹ the Director-General addressed the role of the SAB and its contributions in implementing the Convention. He emphasised the need for sound technical input and scientific guidance for policymakers, noting that while SAB recommendations are not always taken forward, the Board's valuable advice strengthens the policymaking process by provoking discussion and ensuring decision makers are well informed on key technical issues. In this regard, he thanked the SAB Vice-Chairperson for the briefing provided to the Open-Ended Working Group on Future Priorities (OWEG-FP) this past January.² The Director-General was pleased to see that more than 35 delegations attended the SAB Chairperson's briefing on 29 March on the margins of the Twenty-Fifth Session of the SAB.³ He encourages all States Parties to attend these briefings (as well as the Science for Diplomats side events⁴) and participate in the valuable science-policymaker discourse they facilitate. The SAB Chairperson will next brief States Parties on the margins of the Twenty-Sixth Session of the SAB in October 2017.
7. After careful review of the report of the Twenty-Fifth Session of the SAB, the Director-General is pleased to submit to the Executive Council the comments below.

Updates from the Technical Secretariat (paragraphs 6.1 to 6.6, 9.1 to 9.2, 9.7 to 9.8, 9.15 to 9.16, and 12.6 to 12.7 of SAB-25/1*)

8. The Director-General places great importance on ensuring that SAB members are well informed on the work of the Secretariat; particularly those units engaged in contingency operations where scientific and technical advice is continually needed. The insight provided through Secretariat briefings to the SAB ensures that this advice is relevant and timely. The Director-General intends to continue the practice of having Secretariat staff available to discuss their work at upcoming sessions of the SAB.

Engagement with scientific and disarmament communities (paragraphs 7.1 to 7.3 and 9.9 to 9.12 of SAB-25/1*)

9. Given the rapid pace at which science advances, and the ever increasing diffusion and globalisation of scientific knowledge, the provision of technical guidance and insight requires drawing on expertise from multidisciplinary scientific communities. In this regard, the Director-General encourages the SAB to maintain its practice of engaging with scientific organisations and advisory mechanisms from both the scientific and disarmament communities.

¹ The opening remarks from the Director-General at the Twenty-Fifth Session of the SAB are available at: www.opcw.org/fileadmin/OPCW/SAB/en/DG_statement_for_SAB25.pdf

² The presentation from this briefing is available at: www.opcw.org/fileadmin/OPCW/SAB/en/20170131_SAB_Briefing_to_Open_Ended_Working_Group_Future_Priorities.pdf

³ The presentation from this briefing is available at: www.opcw.org/fileadmin/OPCW/SAB/en/SAB-25_Chair_Briefing_to_States_Parties.pdf

⁴ More information about and materials from Science for Diplomats briefings are available at: www.opcw.org/special-sections/science-technology/science-for-diplomats/

10. The Director-General was pleased to see that a representative of the International Union of Pure and Applied Chemistry (IUPAC) was in attendance at the Twenty-Fifth Session of the SAB. IUPAC is an important partner of the OPCW and a valuable resource within the science of chemistry. The Director-General appreciates the SAB's support in maintaining and growing this partnership. Further engagement with IUPAC is planned for July 2017: IUPAC is a co-organiser of the SAB's workshop on emerging technologies in Rio de Janeiro, and the Director-General intends to address the opening ceremony of IUPAC's 44th World Chemistry Congress and the 49th General Assembly in São Paulo.⁵ The World Chemistry Congress will also feature additional presentations by the Secretariat.
11. Sharing experiences with other disarmament organisations that rely on access to sound scientific advice is important for maintaining an effective scientific advisory mechanism. The Director-General welcomed the participation of the Comprehensive Nuclear Test Ban Treaty Organisation (CTBTO) at the Twenty-Fifth Session of the SAB. The CTBTO has championed the consideration of scientific advancements as opportunities to strengthen the capabilities of its international monitoring system. The Director-General notes that the SAB supports a similar approach to new science and technology in regard to verification under the Convention.⁶ Further engagement with the CTBTO is planned at the CTBT Science and Technology Conference in June 2017, where the SAB Chairperson will serve on the organising committee and the Secretariat will give a presentation addressing science in support of international disarmament treaties.⁷

Developments in science and technology (paragraphs 8.1 to 8.12 and 13.5 to 13.7 of SAB-25/1*)

12. The Director-General notes the importance of keeping abreast of and reporting on developments across a dynamic scientific landscape. He appreciates the efforts of the SAB to identify trends and developments, while providing practical and relevant insights from this complex undertaking. The Director-General is pleased to see the SAB looking for innovative ways to capture and address the science and technology issues relevant to States Parties. He looks forward to the SAB's recommendations on next steps.
13. With regard to the programme of the Twenty-Fifth Session of the SAB, the Director-General notes that questions and concerns about the impact of nanotechnologies have frequently been raised, especially with regard to advances in nanomedicine drug delivery. In this regard he commends the SAB for engaging experts involved in the development of nanomedicines in order to better understand the state of the field and its technical realities. In the view of the Director-General,

⁵ For more information on the IUPAC's 44th World Chemistry Congress and 49th General Assembly, see: <http://www.iupac2017.org/index.php>

⁶ See Verification: Report of the Scientific Advisory Board's Temporary Working Group (SAB/REP/1/15, dated 11 June 2015), available at: www.opcw.org/fileadmin/OPCW/SAB/en/Final_Report_of_SAB_TWG_on_Verification_-_as_presented_to_SAB.pdf

⁷ For more information on the 2017 CTBT Science and Technology Conference, see: <https://www.ctbto.org/specials/snt2017/>

engagement with experts who develop real-world applications of new science and technology helps to ensure that our views on these advancements are grounded by technical capabilities demonstrated under real-world situations.

Scientific and technological elements of verification technologies, emerging technologies, and new equipment (paragraphs 9.3 to 9.6, 9.13 to 9.14, and 9.17 to 9.20 of SAB-25/1*)

14. The Director-General notes that the Organisation requires access to the full set of capabilities necessary for the effective implementation of the Convention's verification regime, including for non-routine situations. Given the current challenges to the ban on the usage of chemical weapons, the review of verification-relevant science and technology constitutes an important element in the work of the SAB.
15. The development of methods used to sample and analyse toxins (specifically ricin and botulinum, as discussed at the Twenty-Fifth Session of the SAB) helps to ensure that laboratory capabilities evolve and remain fit for purpose. The diversity of biological toxins further demonstrates the need to engage with relevant experts.⁸ In this context, the Director-General encourages the SAB to continue its watching brief on toxin analysis.
16. The Director-General recognises the need for innovative tools that benefit non-routine verification activities. Methods that integrate measurements with complex data analysis, such as the *Underworlds* project⁹ discussed at the Twenty-Fifth Session of the SAB, continue to be an area of interest as these endeavours offer glimpses into which capabilities are potentially available. With regard to computational tools for chemistry, the Director-General notes that such methods are available and have been used to provide technical insight to the Secretariat.¹⁰

Medical countermeasures, treatment, and response to chemical agents (paragraphs 10.1 to 10.2 of SAB-25/1*)

17. Keeping abreast of current and future methods for responding to and treating chemical injuries is central to the implementation of the Convention. Chemical weapons will become both less effective and less desirable when the injuries caused by these weapons can be more effectively minimised and prevented. The Director-General appreciates the SAB's commitment to keeping abreast of this important topic.

Advice on chemicals (paragraphs 11.1 to 11.2 of SAB-25/1*)

18. The Director-General expresses his appreciation to the SAB for reviewing and updating their advice on riot control agents (RCAs). The new report (SAB-25/WP.1,

⁸ To illustrate the diversity of selected biological toxins, see the following infographic: www.opcw.org/fileadmin/OPCW/Science_Technology/Biological_Toxins_and_their_Relative_Toxicity_.pdf

⁹ For more information on *Underworlds*, see: <http://underworlds.mit.edu/>

¹⁰ See for example, Investigation of Polysulfide Mustard Analogues and Reactive Intermediates from Levinstein Mustard by Density Functional Theory, available at: www.opcw.org/fileadmin/OPCW/Science_Technology/poster_MustardDFT.pdf

dated 27 March 2017) serves as a detailed technical reference to accompany the advice previously issued by the Secretariat in 2014 (S/1177/2014, dated 1 May 2014) and advice that can aid States Parties in identifying chemicals that have been shown to meet the criteria of an RCA as defined in Article II(7) of the Convention. The SAB Chairperson's briefing on the report at the March Science for Diplomats event was well received by delegations and materials are available for distribution.^{11, 12} The Director-General encourages all States Parties to review the report and its associated informational materials. He also takes this opportunity to encourage the SAB to publish this report in peer-reviewed scientific literature.

Advice on chemical forensics and investigative technologies (paragraphs 12.1 to 12.5 of SAB-25/1*)

19. The Director-General congratulates Dr Veronica Borrett for her appointment as Chairperson of the Temporary Working Group (TWG) on Investigative Science and Technology. This TWG will provide valuable advice with relevance to the Secretariat's ongoing contingency operations involving non-routine Convention inspections and verification. These operations include investigation, analysis, fact-finding, and the collection and evaluation of oral, material, and digital evidence. Members of this TWG will be appointed by the Director-General ahead of the Twenty-Sixth Session of the SAB and the first meeting will be held before the end of the first quarter of 2018. The Director-General looks forward to reviewing their deliberations.

FUTURE WORK AND OTHER BUSINESS OF THE SCIENTIFIC ADVISORY BOARD

20. As in 2016, this year the SAB will hold two sessions and two workshops. The first 2017 workshop will focus on emerging technologies and will be co-organised with IUPAC (as noted in paragraph 10). The second workshop, on Trends in Chemical Production, has been scheduled for October 2017 in Zagreb. The Zagreb workshop will also include a commemoration of the OPCW's Twentieth Anniversary.¹³ These workshops are designed to provide input for the SAB's report to the Fourth Review Conference and are made possible by funding through the European Union Joint Action on support for OPCW activities. The development of the report to the Fourth Review Conference is progressing intersessionally, its compilation will be included on the agenda of the Twenty-Sixth Session of the SAB, and the adoption of the final report is expected at its Twenty-Seventh Session (in 2018).
21. The Director-General supports the SAB's view that assessing developments in science and technology should be forward looking and that awareness of the trans-disciplinary ("convergent") nature of technological advancement should be maintained. He further noted that effective review requires consideration of technological discoveries and

¹¹ This Science for Diplomats presentation is available at: www.opcw.org/fileadmin/OPCW/Science_Technology/Diplomats_Programme/20170308_Science_For_Diplomats_RCA_CTimperley.pdf

¹² An infographic summary of the RCA advice is available at: www.opcw.org/fileadmin/OPCW/Science_Technology/riot_control_agents_poster.pdf.

¹³ For more information on the Twentieth anniversary, see: <https://20years.opcw.org/>

their driving forces (including technological, economic, socio-political, and regulatory insights). In this regard, the Director-General looks forward to the SAB's report to the Fourth Review Conference and requests the SAB to provide guidance on relevant trends and issues for the five-year period between the Fourth and Fifth Review Conferences.

22. In addition to the two regular sessions of the SAB and the thematic workshops to be held in 2017, engagement within the scientific community will also play an important role in gathering input for the science and technology review. The Secretariat will continue to provide administrative support for the attendance of SAB members at relevant science events ahead of the Fourth Review Conference. These activities serve to strengthen insight from the review of publications, patents and materials available through online scientific resources.
23. The need for sound technical input for the work of the Secretariat will only continue to grow, thus emphasising the need for scientific literacy in the implementation of the Convention. To this end, the SAB serves as a valuable technical resource that also helps to raise awareness of technical communities, which can in turn further strengthen and support the role of science in disarmament. In this context, the Director-General is pleased to see many SAB members participating in activities related to the OPCW's Twentieth Anniversary. He appreciates the commitment of SAB members to the implementation of the Convention, raising awareness of its norms, and their willingness to stand ready to provide further technical advice and guidance.

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