

**Mandate of the Special Rapporteur on the negative impact of unilateral coercive measures on the enjoyment of human rights**

Ref.: AL USA 13/2022  
(Please use this reference in your reply)

7 September 2022

Excellency,

I have the honour to address you in my capacity as Special Rapporteur on the negative impact of unilateral coercive measures on the enjoyment of human rights, pursuant to Human Rights Council resolution 49/6.

In this connection, I would like to bring to the attention of your Excellency's Government information I have received concerning **restrictions on exports to the Bolivarian Republic of Venezuela of spare parts that are essential for the functioning of electron microscopes**. The restrictions are associated with sanctions imposed against the Venezuelan Government and against key economic sectors, entities and individuals, under a series of U.S. executive orders and laws adopted over the past two decades. I am deeply concerned that the inability to obtain the spare parts impedes the continued use of these microscopes, with **detrimental effects on the rights of the Venezuelan people to the highest attainable standard of health** and to a number of other rights.

According to the information received:

Electron microscopes use streams of electrons that are accelerated in a vacuum and focused into beams which are targeted on the material being examined, irradiating the material and affecting the beams through an interaction that creates a visible image. The magnifying capability of electron microscopes is far greater than that of optical microscopes.<sup>1</sup>

Electron microscopes have numerous medical applications, *inter alia* in visualizing the structure and behavior of viruses too small to be seen with optical microscopes,<sup>2</sup> and in diagnosing diseases that cannot be diagnosed at all, or as rapidly, with optical microscopes.<sup>3</sup> Electron microscopes are also used in developing manufacturing processes and monitoring quality control in industries such as pharmaceuticals, apparel and electronics; in assessing geologic environments around mineral deposits, allowing for reduced

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<sup>1</sup> U.S. Department of Veterans Affairs, "What is an electron microscope (EM) and how does it work?" 1 August 2017, [https://www.va.gov/DIAGNOSTICEM/What\\_Is\\_Electron\\_Microscopy\\_and\\_How\\_Does\\_It\\_Work.asp](https://www.va.gov/DIAGNOSTICEM/What_Is_Electron_Microscopy_and_How_Does_It_Work.asp)

<sup>2</sup> Cynthia S. Goldsmith and Sara E. Miller, "Modern Uses of Electron Microscopy for Detection of Viruses," *Clinical Microbiology Reviews* 22 (4), 2009, pp. 552-563, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2772359/>

<sup>3</sup> U.S. Department of Veterans Affairs, "Diagnostic Electron Microscopy Overview," 21 May 2017, [https://www.va.gov/DIAGNOSTICEM/Diagnostic\\_Electron\\_Microscopy\\_Overview.asp](https://www.va.gov/DIAGNOSTICEM/Diagnostic_Electron_Microscopy_Overview.asp); Lawrence K. Altman, "Electron Microscopes Speeding Diagnoses," *New York Times*, 13 March 1979, <https://www.nytimes.com/1979/03/13/archives/electron-microscopes-speeding-diagnoses-electron-microscopes-used.html>

environmental and other risks; in forensic examinations of criminal evidence;<sup>4</sup> and in many other applications.

There are 14 electron microscopes in Venezuela manufactured by FEI Company (Field Electronic and Ion Company), a wholly owned subsidiary of Thermo Fisher Scientific Inc. Both FEI and Thermo Fisher Scientific are U.S. corporations. These microscopes are located at Venezuelan universities, research and development centers, forensic laboratories and quality control laboratories.

The microscopes periodically require parts to be replaced in order to remain in operation and avoid damage. U.S. sanctions have prevented Venezuelan institutions from obtaining the necessary parts. As a result, at present, only three electron microscopes are still operating in Venezuela.

Replacement parts, including an “extreme field emission gun” that emits electrons, and an x-ray diaphragm assembly, were ordered in 2018 by the Central University of Venezuela and the Venezuelan Institute for Scientific Research for their FEI electron microscopes<sup>5</sup>. Thus far, however, they have not been received because the sanctions prevented the spare parts – an “extreme field emission gun” that emits electrons, and an x-ray diaphragm assembly – from being shipped to Venezuela. The order was processed through FEI Europe B.V., a FEI’s Dutch subsidiary,. The parent company, Thermo Fisher Scientific, has been unable to obtain U.S. export licenses for them.

Without prejudging the accuracy of the information received, I wish to express my serious concerns about the impact that the U.S. restrictions on shipments of electron microscope parts to Venezuela is having on the human rights of the Venezuelan population, most notably the right to health but also a number of other rights including the right to life, freedom of research, access to scientific knowledge, that your Excellency’s Government is obliged by international law to protect and respect; and on the human rights of other individuals living in other parts of the world.

I wish to stress that Article 25 of the Universal Declaration of Human Rights recognizes the right of everyone to a standard of living adequate for the health and well-being of himself and of his family, including medical care. I also wish to recall Article 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR), signed by your Excellency’s Government on 5 October 1997. With said signature, the United States Government agreed to bind itself in good faith to ensure that nothing is done that would defeat the object and purpose of the Covenant, pending a decision on its ratification.

I am deeply troubled that, by impeding shipments of electron microscope parts to Venezuela, the sanctions enforced by your Excellency’s Government are causing the dismantling of some of the medical infrastructure that is necessary to ensure the

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<sup>4</sup> Yolanda Smith, “Applications of Electron Microscopy,” Medical/Life Sciences News, 26 February 2019, <https://www.news-medical.net/life-sciences/Applications-of-Electron-Microscopy.aspx>

<sup>5</sup> One is an analytical scanning electron microscope, the other is an analytical transmission electron microscope.

full enjoyment of the right to health by the Venezuelan population.

My concern is heightened by the U.S. Government's awareness that, without the possibility to use electron microscopes, it is not possible to detect some specific types of diseases with the result that the individuals who suffer from them will not have access to appropriate medical care. According to reports of Your Excellency's Government, certain kidney's diseases, for instance, can only be diagnosed with the use of electron microscopes "and this in turn affects the prognosis and selection of therapy,"; and some abnormal growths [of kidneys] that may be cancerous are identifiable only with the use of such microscopes "with obvious implications for prognoses and selection of therapy."<sup>6</sup> Furthermore, according to your Excellency's Government, electron microscopy is "the gold standard for diagnosis of many kidney, muscle, nerve, lung and skin diseases" and "the value of electron microscopy in difficult diagnostic situations has been demonstrated repeatedly"<sup>7</sup>

Besides the impact on individuals' right to health, this right is harmed more generally when Venezuelan scientists lose access to functioning electron microscopes for research that yields medical knowledge for the benefit of all peoples in the world. It bears noting that for decades Venezuela had been one of the most dynamic Latin American countries in advancing medical knowledge through the use of electron microscopes.<sup>8</sup> The expertise of Venezuelan researchers in this field is recognized globally; their work with electron microscopes has produced discoveries about *inter alia* the structure of nerve fibers<sup>9</sup> and the pathology of tumors and viruses, including HIV and SARS CoV-2 (the coronavirus responsible for COVID-19), as well as parasitic and fungal diseases.<sup>10</sup>

I further note that electron microscopes are critical for pharmaceutical research that leads to new drugs and vaccines, and in identifying any contamination during the process of manufacturing them,<sup>11</sup> thus multiplying their importance to ensuring the right to health.

I wish to remind your Excellency's Government that its obligation to ensure the right to health entails the duty to "refrain at all times from imposing embargoes or similar measures restricting the supply of another State with adequate medicines and

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<sup>6</sup> U.S. Department of Veterans Affairs, "Diagnostic Electron Microscopy Overview," 21 May 2017, [https://www.va.gov/DIAGNOSTICEM/Diagnostic\\_Electron\\_Microscopy\\_Overview.asp](https://www.va.gov/DIAGNOSTICEM/Diagnostic_Electron_Microscopy_Overview.asp)

<sup>7</sup> U.S. Department of Veterans Affairs, "Role of Diagnostic Electron Microscopy in Veterans' Health Care," 4 December 2018, <https://www.va.gov/DIAGNOSTICEM/index.asp>

<sup>8</sup> Alwyn Eades, "Electron Microscopy in Latin America," *In Focus*, December 2006, pp; 16-17, <https://pixl8-cloud-rms.s3.eu-west-2.amazonaws.com/prod/public/uploaded/e4254d65-7f04-4689-bdb07ba905a7f94f.pdf>

<sup>9</sup> Embassy of Venezuela (Washington), "Venezuelan Scientist Uncovers Nerve Substructure," *Venezuela Up-to-date*, April 1952, p. 1.

<sup>10</sup> Jorge García Tamayo, "Treinta y cinco años en la historia venezolana de dos microscopios electrónicos," in *La Microscopía Electrónica en Venezuela: Orígenes y Desarrollo*, ed. José A. Serrano (Mérida : Universidad de los Andes, 2010), pp. 131-132; Carmen L. Loureiro *et al.*, "SARS-CoV-2 genetic diversity in Venezuela: Predominance of D614G variants and analysis of one outbreak," *PLoS One*, 19 February 2021, pp. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7895374/pdf/pone.0247196.pdf>

<sup>11</sup> M.O. Deschuyteneer and A. Miseur, "Electron Microscopy in Vaccines Discovery, Development, Characterization and Quality Control," *Microscopy and Microanalysis* 18 (S2), 2012, pp. 234-235; Thermo Fisher Scientific Inc., "Phenom Desktop Electron Microscopy: Pharmaceutical," <https://www.phenom-world.com/pt/markets/pharmaceutical>

medical equipment,”<sup>12</sup> as well as the duty to guarantee “a minimum level of access to the essential material components of the right to health.”<sup>13</sup>

Due to an absence of specific violations, a ruling has been passed by Venezuela's Tribunal of Justice that this case cannot be taken on at the domestic level, as there are international factors at play, infringing on the right to health.<sup>14</sup> Given these parameters, I stress that this be transposed to the international level where the legal obligation of states is clearly broader. According to the wording in the ICESCR and the Universal Declaration of Human Rights (UDHR), the obligation for all states is to ensure the right to health for “everyone.” Moreover, this right is deemed to include the availability of adequate and functioning facilities and equipment.<sup>15</sup>

Because the use of electron microscopes today is vital to adequate medical care, my concerns extend to the potential consequences of inadequate medical care on the right to life of people in Venezuela, which is enshrined in the International Covenant on Civil and Political Rights (ICCPR), ratified by the United States on 8 June 1992, as well as in the UDHR. I remind your Excellency's Government of its obligation to protect the right to life of Venezuelans, insofar as blocking the shipments of electron microscope parts may directly impact their enjoyment of this right. I refer here to the extraterritorial nature of the human rights obligations of States in “cases where the duty-bearing State exercises no effective control over the right-holder, but only has control over a potential cause of harm to that person.”<sup>16</sup>

I also refer to the obligation of states enshrined in the UN Human Rights Committee General Comment No. 36(2018) to take “appropriate legislative and other measures to ensure that all activities ... having a direct and reasonably foreseeable impact on the right to life of individuals outside their territory, including activities taken by corporate entities based in their territory or subject to their jurisdiction, are consistent with article 6”

I further draw the attention of your Excellency's Government to the right to enjoy the benefits of scientific progress and its applications, inscribed in the ICESCR, which encompasses “not only a right to receive the benefits of the applications of scientific progress, but also a right to participate in scientific progress.”<sup>17</sup> This right is

<sup>12</sup> UN Committee on Economic, Social and Cultural Rights, General Comment No. 14 (2000) on the right to the highest attainable standard of health, E/C.12/2000/4, para. 41, <https://digitallibrary.un.org/record/425041?ln=en>

<sup>13</sup> UN OHCHR and World Health Organization, “The Right to Health,” Fact Sheet No. 31, 2008, p. 5, <https://www.ohchr.org/sites/default/files/Documents/Publications/Factsheet31.pdf>

<sup>14</sup> *Federación Médica Venezolana v. Ministra de Salud y Desarrollo Social et al.*, Tribunal Supremo de Justicia, Sala Constitucional, Judgment 1002, Case no. 02-2167, 26 May 2004, <http://historico.tsj.gob.ve/decisiones/scon/mayo/1002-260504-02-2167%20.HTM>

<sup>15</sup> UN Committee on Economic, Social and Cultural Rights, General Comment No. 14 (2000) on the right to the highest attainable standard of health, E/C.12/2000/4, para. 12 (a) and (d), <https://digitallibrary.un.org/record/425041?ln=en>

<sup>16</sup> Samantha Besson, “Due Diligence and Extraterritorial Human Rights Obligations – Mind the Gap!” ESIL Reflections 9 (1), 2020, <https://esil-sedi.eu/esil-reflection-due-diligence-and-extraterritorial-human-rights-obligations-mind-the-gap/>

<sup>17</sup> UN Committee on Economic, Social and Cultural Rights, General Comment No. 25 (2020) on science and economic, social and cultural rights (article 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights), 30 April 2020, document E/C.12/GC/25, para. 11, <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G20/108/12/PDF/G2010812.pdf?OpenElement>

enshrined in the UDHR as well. Because the benefits of scientific progress are global, blocking Venezuelan scientists from having functioning electron microscopes harms this right for people globally – including many more U.S. citizens than Venezuelan citizens (the U.S. population is 11 times that of Venezuela).<sup>18</sup> Indeed, a past U.S. President cited the value *to the United States* of medical research involving electron microscopes at the Venezuelan Institute for Scientific Research, one of the entities that had ordered the spare parts.<sup>19</sup>

I additionally note that preventing the shipment of parts for electron microscopes to Venezuela violates the obligation of your Excellency's Government under the Florence Agreement, ratified by the United States on 2 November 1966 and given domestic legal effect by Public Law 89-651 of 14 October 1966, to undertake to promote the free circulation of scientific materials and to abolish or reduce any restrictions to their free circulation.<sup>20</sup> Electron microscopes are specifically mentioned by the U.S. Government as being covered by the Florence Agreement's provisions.<sup>21</sup>

The right to education, affirmed *inter alia* in the ICESCR and the UDHR, is also harmed by the erosion of Venezuela's ability to train scientists in electron microscopy, which naturally requires functioning equipment. I wish to stress that harming this right in Venezuela affects many other countries as well; the Venezuelan Institute for Scientific Research uses its equipment from FEI to educate scientists from throughout Latin America in electronic microscopy techniques<sup>22</sup>.

Finally, I highlight that preventing shipments of electron microscope parts to Venezuela may also negatively affect the due process rights enshrined in the ICCPR. The precise analyses of forensic evidence, for instance, is important to ensure the proper functioning of a country's criminal justice system.<sup>23</sup> Although the U.S. Government has expressed displeasure with the functioning of Venezuelan justice by imposing targeted sanctions against key judges and other personnel,<sup>24</sup> harming the system's structural potential to ensure due process and fair trial standards is detrimental to the rights of individuals who are involved in judicial procedures. A

<sup>18</sup> U.S. Census Bureau, "Quick Facts," <https://www.census.gov/quickfacts/fact/table/US/PST045221;World> Bank, "Population, total – Venezuela, RB," <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=VE>

<sup>19</sup> Letter from Dwight D. Eisenhower to Lewis L. Strauss, 16 June 1955, approving an agreement for the United States to assist the Venezuelan Government's Institute of Neurology and Brain Research (now the Venezuelan Institute for Scientific Research) in building small reactors for medical research and to supply uranium for them, to produce radioisotopes used with electron microscopes (U.S. Senate, "Proposed Agreements for Cooperation Between the United States and Argentina, Chile, China, Denmark, Greece, Israel, Italy, Japan, Korea, Lebanon, Netherlands, Pakistan, Peru, Philippines, Portugal, Spain, Sweden, Switzerland, Uruguay, and Venezuela," Report No. 1197, 28 July 1955, pp. 102-103).

<sup>20</sup> Agreement on the Importation of Educational, Scientific and Cultural Materials, 17 June 1950 (Florence Agreement), article IV (a).

<sup>21</sup> U.S. Tariff Commission, "Electron, Proton, and Similar Microscopes and Diffraction Apparatus," Report to the President, 1972, p. 12, <https://www.usitc.gov/publications/tea/pub487.pdf>

<sup>22</sup> Gobierno Bolivariano de Venezuela, Ministerio del Poder Popular para Ciencia y Tecnología, Centro Latinoamericano FEI de Crio-Microscopía Electrónica (CLAFCEME), <https://ivic.gov.ve/investigacion-3/alojados/clafme> Centro de Biología Estructural del Mercosur, "Caracas/CLAFCEME," <https://www.cebem-lat.org/miembros/venezuela/clafce/>.

<sup>23</sup> Rodney Uphoff, "Convicting the Innocent: Aberration or System Problem," *Wisconsin Law Review*, 2006 (2), p. 817.

<sup>24</sup> U.S. Department of the Treasury, "Treasury Sanctions Eight Members of Venezuela's Supreme Court of Justice," press release, 18 May 2017, <https://home.treasury.gov/news/press-releases/sm0090>; U.S. Department of the Treasury, "Treasury Designates Venezuelan Officials Involved in the Unjust Trial of the 'Citgo 6,'" press release, 30 December 2020, <https://home.treasury.gov/news/press-releases/sm1225>

study funded by your Excellency's Government noted that the analysis of criminal evidence can influence whether a case is brought to trial, and that evidence may not be presented if there are delays in analyzing it;<sup>25</sup> the availability of functioning electron microscopes can have a bearing on such situations.

In connection with the above alleged facts and concerns, please refer to the **Annex on Reference to international human rights law** attached to this letter which cites international human rights instruments and standards relevant to these allegations.

As it is my responsibility, under the mandate provided to me by the Human Rights Council, to seek to clarify all cases brought to my attention, I would be grateful for your observations on the following matters:

1. Please explain whether the non-issuance of export licenses for the shipment to Venezuela of electron microscope parts that were ordered in 2018 by the Central University of Venezuela and the Venezuelan Institute for Scientific Research from FEI/Thermo Fisher Scientific is the result of a specific decision or general practice to deny the request for such licenses in connection with the U.S. sanctions, or contingent on of other reasons.
2. If it is the result of a decision or practice to deny the licenses, I would be grateful for an explanation. Please also explain whether human rights due diligence was undertaken in the course of reaching the decision or developing the practice, and how the decision or practice is aligned with the human rights obligations of your Excellency's Government. If the non-issuance is the result of a bureaucratic delay, please explain how, and how rapidly, it may be overcome and confirm that the intended outcome is the issuance of the export licenses. If the non-issuance is due to some other reason, please explain the circumstances that led to this result and whether they can be reversed so that the licenses are issued.
3. I would be grateful to know if your Excellency's Government has assessed, or will assess, the nature and extent of any human rights impact of the non-issuance of the export licenses since 2018; and whether it has taken, or will take, measures to halt or mitigate any damage it identifies, particularly to the right to health of Venezuelan individuals but also to other rights and individuals, as explained above.

This communication and any response received from your Excellency's Government will be made public via the communications reporting [website](#) within 60 days. They will also subsequently be made available in the usual report to be presented to the Human Rights Council.

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<sup>25</sup> Joseph Peterson and Ira Sommers, "The Role and Impact of Forensic Evidence in the Criminal Justice Process," National Institute of Justice, Report 6-10-10, 2006, pp. 10, 124, <https://www.ojp.gov/pdffiles1/nij/grants/231977.pdf>

While awaiting a reply, I urge that all necessary interim measures be taken to halt the alleged violations and prevent their re-occurrence and in the event that the investigations support or suggest the allegations to be correct, to ensure the accountability of any person(s) responsible for the alleged violations.

I may publicly express my concerns in the near future as, in my view, the information upon which the press release will be based is sufficiently reliable to indicate a matter warranting immediate attention. I also believe that the wider public should be alerted to the potential implications of the above-mentioned allegations. The press release will indicate that I have been in contact with your Excellency's Government to clarify the issue/s in question.

As per the standard procedures of Special Procedures communications, please be informed that a copy of this letter will be shared with the Bolivarian Republic of Venezuela.

Please accept, Excellency, the assurances of my highest consideration.

Alena Douhan  
Special Rapporteur on the negative impact of unilateral coercive measures on the  
enjoyment of human rights

## Annex

### Reference to international human rights law

In connection with the above concerns, I would like to refer your Excellency's Government to the relevant international norms and standards that are applicable to the issues brought forth by the situation described.

With respect to the right to health, I refer to the International Covenant on Economic, Social and Cultural Rights (ICESCR), which enshrines "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health" (article 12). Specifically, this includes "The creation of conditions which would assure to all medical service and medical attention in the event of sickness (article 12(d)). More specifically, "the right to health must be understood as a right to the enjoyment of a variety of facilities, goods, services and conditions necessary for the realization of the highest attainable standard of health" (Committee on Economic, Social and Cultural Rights, General Comment No. 14 (2000), para. 9).

The right to health is also embodied in the Universal Declaration of Human Rights (UDHR), which states that "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including (...) medical care (article 25(1)).

As the right to health is deemed to include the obligation for states to "promote the development of (...) diagnostic tools through research and development,"<sup>26</sup> it follows that the obligation extends to not undermining the functioning of diagnostic equipment that is already in use. I call your attention to the observation that "the capacity to make an accurate diagnosis" is integral to the right to health,<sup>27</sup> and by extension the right to life.<sup>28</sup>

I also refer to the duty to "refrain at all times from imposing embargoes or similar measures restricting the supply of another State with adequate medicines and medical equipment" (Committee on Economic, Social and Cultural Rights, General Comment No. 14 (2000), para. 41). This is reflected in the Maastricht Principles on Extraterritorial Obligations of States in the Area of Economic, Social and Cultural Rights, which call on states to refrain from applying such trade restrictions to goods and services that are essential to meeting their core human rights obligations (Principle 22).<sup>29</sup>

Regarding the right to life, I draw your attention to the International Covenant on Civil and Political Rights (ICCPR), which recognizes that "Every human being has

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<sup>26</sup> UN OHCHR and World Health Organization, "The Right to Health," Fact Sheet No. 31, 2008, p. 8, <https://www.ohchr.org/sites/default/files/Documents/Publications/Factsheet31.pdf>

<sup>27</sup> Lawrence Shulman, Claire Wagner and Danny Milner, Jr., "Pathology is a Human Right," *The Pathologist*, 17 November 2016, <https://thepathologist.com/outside-the-lab/pathology-is-a-human-right>

<sup>28</sup> Defensoría del Pueblo (Colombia), *El Derecho a la Salud en la Constitución, la Jurisprudencia y los Instrumentos Internacionales* (Bogotá: Defensoría del Pueblo, 2003), pp. 100, 208.

<sup>29</sup> ETO Consortium, Maastricht Principles on Extraterritorial Obligations of States in the Area of Economic, Social and Cultural Rights (Heidelberg, FIAN international, 2013), [https://www.etoconsortium.org/nc/en/main-navigation/library/maastricht-principles/?tx\\_drblob\\_pi1%5BdownloadUId%5D=23](https://www.etoconsortium.org/nc/en/main-navigation/library/maastricht-principles/?tx_drblob_pi1%5BdownloadUId%5D=23)



the inherent right to life” (article 6(1)) and reaffirms the enshrining of this right in the UDHR (article 3). I further refer to the UN Human Rights Committee’s General Comment No. 36 (2018), in which it states that the right to life “should not be interpreted narrowly” and that it “concerns the entitlement of individuals to be free from acts and omissions that are intended or may be expected to cause their unnatural or premature death” (para. 3). The General Comment further notes that the obligation to uphold the right to life “extends to reasonably foreseeable threats and life-threatening situations that can result in loss of life (para. 7). It also refers to the obligation of states to take appropriate measures to “take appropriate legislative and other measures to ensure that all activities taking place in whole or in part within their territory and in other places subject to their jurisdiction, but having a direct and reasonably foreseeable impact on the right to life of individuals outside their territory, including activities taken by corporate entities based in their territory or subject to their jurisdiction are consistent with article 6” (para. 22).

With respect to the right to conduct and benefit from scientific research, I refer to the ICESCR, in which states recognize “the right of everyone (...) (t)o enjoy the benefits of scientific progress and its applications” (article 15(1)(b)). Additionally, “The steps to be taken by the States Parties to the present Covenant to achieve the full realization of this right shall include those necessary for (...) the development (...) of science” (article 15(2)). Moreover, the States Parties “undertake to respect the freedom indispensable for scientific research (...)” (article 15(3)). This right is also embodied in the UDHR, which states that “Everyone has the right freely to (...) share in scientific advancement and its benefits” (article 27(1)).

I point out that this right consists of “not only a right to receive the benefits of the applications of scientific progress, but also a right to participate in scientific progress” (Committee on Economic, Social and Cultural Rights, General Comment No. 25 (2020), para. 11).

I additionally refer to the Agreement on the Importation of Educational, Scientific and Cultural Materials (Florence Agreement) of 1950, which obliges states to make efforts “to promote by every means the free circulation of educational, scientific or cultural materials, and abolish or reduce any restrictions to that free circulation which are not referred to in this agreement” (article IV(a)). Microscopes are on the list of scientific equipment that the Agreement covers (Annex D). The Nairobi Protocol to the Agreement (1976), which broadened its scope, was drafted by a committee of governmental experts who “attached considerable importance to the free circulation of scientific equipment, particularly for the developing countries. They stressed that this annex to the Agreement should be administered in the most liberal manner consonant with the great progress made in science and technology since the Agreement was drafted.”<sup>30</sup>

I further point out that the right to enjoy the benefits of scientific progress is “intrinsically linked to (...) the right to development,”<sup>31</sup> which the Declaration on the

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<sup>30</sup> UNESCO, “Importation of educational, scientific and cultural materials: A guide to the operation of the ‘Florence Agreement’ and its Protocol,” revised ed., 1978, p. 22, <https://unesdoc.unesco.org/ark:/48223/pf0000059329>

<sup>31</sup> UNESCO, “The Right to Enjoy the Benefits of Scientific Progress and its Applications,” 2009, p. 5, <https://unesdoc.unesco.org/ark:/48223/pf0000185558>

Right to Development refers to as “an inalienable human right” (UN General Assembly resolution 41/128 (1986), Article 1). While the declaration does not create binding obligations, the core principles it embodies “are anchored in legally binding international law such as the Charter of the United Nations, International Covenants and Conventions on Human Rights”<sup>32</sup>.

I refer next to the right to education, which is enshrined in the ICESCR (article 13) and the UDHR (article 26) as being a right that applies to “everyone,” and which is essential for achieving the scientific progress that I refer to above and thus to the right to enjoy its benefits. Included in the right to education is “the study of technologies and related sciences and the acquisition of practical skills” (Committee on Economic, Social and Cultural Rights, General Comment No. 13 (1999), para. 16). Moreover, this right entails the obligation to respect, protect and fulfill the features essential for education, including its availability, which involves *inter alia* the presence of materials necessary for providing training (General Comment No. 13, para. 50).

Finally, with respect to the rights relating to due process, I refer to the ICCPR, in which article 14(2) establishes that all persons charged with criminal offences are to be presumed innocent until their guilt is established through legal procedures, while article 14(1) holds that everyone charged with a crime “shall be entitled to a fair and public hearing by a competent, independent and impartial tribunal established by law.” I draw your attention to the fact that standards of admissible evidence are integral to legal procedures and help ensure the fairness of trials by limiting evidence to reliable findings; these standards evolve with scientific advances<sup>33</sup> and can rely on the use of specialized equipment, as a former U.S. Government official explains: “Forensic science must deal with an incredibly wide range of interdisciplinary fields, from DNA sequencing to electron microscopy to the visual matching of patterns like footprints or tool marks,” and consequently “the full range of measurement tools (is) required for ensuring confidence in results.”<sup>34</sup>

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<sup>32</sup> OHCHR, “United Nations Special Rapporteur on the Right to Development: An introduction to the mandate,” p. 6, [https://www.ohchr.org/sites/default/files/SRRRightDevelopment\\_IntroductiontoMandate.pdf](https://www.ohchr.org/sites/default/files/SRRRightDevelopment_IntroductiontoMandate.pdf)

<sup>33</sup> U.S. Senate, Hearing before the Committee on Commerce, Science, and Transportation on “The Science and Standards of Forensics,” 28 March 2012, Statement by Sen. John D. Rockefeller IV (Chairman), <https://www.govinfo.gov/content/pkg/CHRG-112shrg77701/html/CHRG-112shrg77701.htm>

<sup>34</sup> U.S. Senate, Hearing before the Committee on Commerce, Science, and Transportation on “The Science and Standards of Forensics,” 28 March 2012, Statement by Patrick D. Gallagher, Under Secretary of Commerce for Standards and Technology, U.S. Department of Commerce, <https://www.govinfo.gov/content/pkg/CHRG-112shrg77701/html/CHRG-112shrg77701.htm>