smaller organizations may exacerbate the risks of deploying new technology.[5] As Jonathan Drake emphasized in his remarks, human rights organizations that have the ability to do this work must consider how to create sustainable interventions.[6]

Further, it is not clear how to reconcile the different approaches to risk embedded in the culture and practices of human rights researchers on the one hand, and innovators on the other. Innovation in Silicon Valley privileges failure as an essential mechanism of feedback and emphasizes the importance of moving quickly and fixing problems later. Human rights, however, necessarily tolerates less risk because of the potential impact on rights and on the security and safety of victims, witnesses, and investigators. How do we reconcile the desire for robust innovation with the need to ensure safety and protect rights? With the legal and ethical demands of fact-finding? Even if attending to these concerns means less innovation, the importance of considering the human rights impact of new technological developments before deployment cannot be overstated.[7]

All of these risks and opportunities are being generated in an environment in which human rights organizations, funders, and technology companies are encouraging technological solutions to documentation and advocacy problems.[8] Yet the challenges that human rights documentation and advocacy face—from failures of political will to breakdowns in the rule of law—will not be solved by new technologies. The allure of "technological solutionism"[9] should not lead us to "neglect the more traditional advocacy and grassroots mobilization strategies that are necessary to generate the political will required for social change."[10]

The panelists considered these questions from the perspective of experts supporting international investigations, academics monitoring the rise and challenges technology, and justice sector officials who grapple with technology-generated data in court proceedings. Brad Samuels is a partner at SITU Research, a design firm in New York, where he heads a division specializing in the use of new technologies to document human rights abuses. Jonathan Drake is Senior Program Associate in the Geospatial Technologies Project at the American Association for the Advancement of Science. Rebecca Hamilton is Assistant Professor of Law at American University Washington College of Law. Julian Nicholls is Senior Trial Attorney at the Office of the Prosecutor at the International Criminal Court. Brittany Benowitz is Chief Counsel at the Center for Human Rights at the American Bar Association.

Remarks by Jonathan Drake*

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Since 2005, the American Association for the Advancement of Science (AAAS) has been exploring the use of Geospatial Technologies in a Human Rights Context. These efforts began

[5] Ella McPherson, *Risk and the Pluralism of Digital Human Rights Fact-Finding and Advocacy*, *in* New Technologies for Human Rights Law and Practice, *supra* note 1, at 188, 188.

[6] Land & Aronson, *supra* note 3, at 127 ("Local groups do not have the resources they need to use technology effectively or safely in their work, and more powerful groups may appropriate the documentation they produce without providing any direct benefit in return.").

[7] Lea Shaver, *Safeguarding Human Rights from Problematic Technologies*, *in* New Technologies for Human Rights Law and Practice, *supra* note 1, at 26, 44 (arguing that the human right to share in the benefits of science means that "[t]he introduction of unproven and potentially dangerous technologies" should be subjected to safeguards similar to those that accompany the human subjects research).

[8] Land & Aronson, *supra* note 3, at 128.

[9] Evgeny Morozov, To Save Everything, Click Here: The Folly of Technological Solutionism 6 (2013).

[10] Land & Aronson, *supra* note 1, at 13.

* American Association for the Advancement of Science.

under the auspices of the Science and Human Rights Program, and focused primarily on establishing whether and to what extent satellite imagery could be used to document human rights violations resulting from armed conflict. In partnership with Amnesty International, the project's first applications of this technology involved using visible and near-infrared satellite imagery to investigate reports of villages being burned in Darfur, Sudan. These efforts established the usefulness of satellite imagery as a tool that allowed investigators access areas that would otherwise be completely off-limits due to governmental restrictions, security considerations, remoteness, or some combination of all three. They likewise established a model of collaboration that has proven itself time and again in the application of these new tools to human rights responses.

As a scientific organization, AAAS lacks the sources of information, such as networks of contacts on the ground, which many human rights organizations rely on daily for information on the situation in areas of conflict. Similarly, many human rights organizations lack the technical resources and expertise to evaluate geospatial intelligence in a scientifically valid context. By partnering with actors in the NGO sector, AAAS is able to lend its skills in this area of critical need, while in exchange taking advantage of the knowledge that human rights advocates possess regarding where and when violations are alleged to have taken place. This symbiotic relationship goes well beyond the sharing of information and analysis resources, however; it also increases the effectiveness of human rights advocates, in the spheres of both public opinion and law.

Because of its commitment to scientific integrity, AAAS is obligated to follow the facts wherever they may lead, irrespective of whether they support a particular narrative. By consistently refraining from making any value judgments regarding a given situation, and steadfastly refusing to engage in advocacy for any side in a conflict, AAAS has established a reputation for impartiality that inoculates it from the charges of political or ideological bias that are often leveled, rightly or wrongly, at human rights advocates throughout the world. Human rights organizations, however, will often cite AAAS's analysis in their reporting, thereby increasing the credibility and impact of their advocacy efforts and encouraging further information sharing. This separation of analysis from advocacy is critical, as there have been cases where geospatial evidence has been thrown out of court due to analysts engaging in advocacy activities that call into question their impartiality.

This model has resulted in numerous success stories over the years, many of which go well beyond simple visual interpretation of "before and after" satellite imagery. For example, in 2009, AAAS partnered with both Amnesty International and Human Rights Watch to investigate reports of shelling in an area that had been designated a "Civilian Safe Zone." By analyzing the distinctive patterns on the ground made by artillery shells as they burst, AAAS analysts were able to trace these shells to mortar positions located in territory outside the zone, apparently controlled by the Sri Lankan government. Likewise, over the course of the conflict, analysts were able to observe a significant number of burials taking place within the zone, alongside thousands of makeshift structures that had apparently been erected by displaced persons.

Another case study where careful, quantitative analysis was key to understanding the true nature of a conflict took place during AAAS's 2014 investigation of the conflict in eastern Ukraine. In the spring of that year, NATO released an analysis of commercial satellite imagery which it claimed showed a large-scale military buildup in southwestern Russia, near the Ukrainian border. In response to this, the Russian Ministry of Defense claimed that the images NATO analyzed in fact depicted military exercises that had been held the previous summer, and which were therefore unrelated to the conflict in Donbass. As part of its analysis, however, AAAS had acquired the same commercial images that NATO relied upon, as well as other images, acquired earlier, for comparison purposes. One such pre-conflict image, acquired during the same time period that Russia claimed NATO's images had been, clearly showed trees in full leaf, as would be expected for

the height of summer. The images released by NATO, and also analyzed by AAAS, however, showed bare trees, as would be expected for early spring in the northern hemisphere.

Although the above example is essentially qualitative, similar competing claims have also been investigated quantitatively. During the same Ukrainian conflict, for example, Russian forces were alleged by many Western governments to have downed a Malaysian airliner, MH-17, using a "Buk" surface-to-air missile. The Russian Ministry of Defense advanced a number of alternative theories regarding this incident, one of which centered on satellite imagery which they released purporting to show a similar missile launcher located in Ukrainian-controlled territory, which they alleged could have shot down the aircraft. Metadata released with this imagery included date and time stamps that corroborated the Russian timeline. AAAS conducted a careful investigation of the shadows of various features present in the image, however, which showed that the azimuth of the sun at the time that the images were acquired was inconsistent with the times marked on the images. This finding cast the timeline advanced by the Russian Ministry of Defense into considerable doubt.

Not all of AAAS's research involves armed conflict. In Nigeria, for example, AAAS conducted a large study in partnership with Amnesty International into the effects of environmental contamination on communities in the Niger Delta. This region, rich in petroleum resources, has been at the center of a long-running debate over allegations of corruption, impunity, and the rights of local people to benefit from development. For example, despite a government moratorium on "gas flaring," in which excess methane extracted from oil wells is burned off in the atmosphere, reports alleged that the practice remained widespread. To investigate this, AAAS researchers took advantage of the fact that such gas flares, due to their high temperature, must emit significant amounts of infrared radiation. By leveraging the MODIS satellite's ability to detect these wavelengths, it was possible to quickly identify the likely locations of several dozen such clandestine gas flares over an extremely broad area, whose existence was subsequently confirmed by targeted acquisitions of high-resolution satellite imagery.

Beyond satellite imagery, AAAS continues to develop new human rights applications of emerging technologies. In recent years, a major focus of this initiative has centered around unmanned aerial systems (UAS), colloquially known as drones. Through partnerships with NGOs including Equitas and the Guatemalan Forensic Anthropology Foundation (FAFG), AAAS has pioneered the use of UAS as a tool for documenting the exhumation of mass graves. This method, which relies on commercial, off-the-shelf technology to create detailed three-dimensional models of gravesites at all stages of excavation, allows the forensic team to visualize the grave from any vantage point, including many (e.g. from the sides or below) that are impossible to achieve in the real world. The new perspective afforded by this capability can reveal aspects of a grave, such as the spatial relationships between successive skeletons superposed atop one another, that are not obvious to field investigators, whose perspective during an exhumation is limited to viewing one layer at a time. Because the model is fully quantitative and georeferenced, it also allows investigators to return, virtually, to the site at any time, even after its real-world counterpart has been destroyed through exhumation, to perform additional measurements, should they be deemed necessary. By combining the data derived from mapping using UAS with historical, declassified satellite imagery of the same area, it is even possible to interpret twenty-first century exhumations in the context of the land-use and land-cover that prevailed at the site in the 1980s, during which time the majority of such mass graves were created.

The examples outlined above are just a few highlights of the work that AAAS has conducted over the years in bringing these exciting new technologies to bear on critical problems at the intersection of science and human rights. Looking to the future, AAAS intends to continue to innovate at this critical juncture, through initiatives to engage more with the vast reservoir of knowledge

represented by the AAAS membership, as well as explorations of other emerging technologies, such as artificial intelligence and machine learning. As these and other technologies become increasingly widespread, great attention must also be paid to ensuring that they are applied in an ethical manner—an obligation that is all the more pressing when the applications involve the types of vulnerable populations that are often associated with human rights investigations. AAAS is dedicated to ensuring that this obligation does not go unheeded, through activities dedicated to exploring the impacts, both positive and negative, that may be associated with these powerful new tools, in order to better fulfill the mandate of our organization's motto: "Advancing Science, Serving Society."

New Technologies in International Criminal Investigations

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*By Rebecca J. Hamilton**

My current research looks at ways in which people and institutions are using technology to build the evidentiary record in international criminal litigation. In particular, I focus on the collection of, and reliance on, what I call user-generated evidence.[1] This is footage that an ordinary citizen—the user—records on their smartphone, in an effort to achieve legal accountability.[2]

The collection of user-generated evidence is a phenomenon that the American public has become increasingly familiar with through the Black Lives Matter movement, thanks to user recordings of police brutality. Yet the phenomenon is a global one; with smartphones in the hands of an estimated 2.5 billion users, user-generated evidence is being captured worldwide.[3] The United Nations is working to secure evidence captured by local actors, even in the absence of courts with jurisdiction over the crimes in question.[4] And organizations like the International Bar Association and the long-time video advocacy group, WITNESS, have now developed user-generated evidence applications ("apps") to enable users to record footage with sufficient metadata to satisfy evidentiary standards for authentication.[5]

The question of authentication is obviously a key challenge for digital evidence in an era when DeepFake technology enables even those with minimal technical skills to create forgeries that are undetectable to the lay eye.[6] But the authentication of evidence is hardly a new challenge;

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[1] *See* Rebecca J. Hamilton, *User-Generated Evidence*, 57 Colum. J. Transnat'l L. (forthcoming, 2019).

[2] I consciously refer to the ordinary citizen who records this footage as a (smartphone) "user" rather than as a "citizen" in order to not exclude users who are stateless or do not have citizenship in the locations where they are filming.

[3] *Number of Smartphone Users Worldwide from 2014 to 2020 (in Billions)*, Statista, *at* https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide.

[4] The International, Impartial and Independent Mechanism (IIIIM), established by the UN General Assembly in relation to the conflict in Syria, is collating user-generated evidence for use in future prosecutions.

[5] *See* Int'l Bar Ass'n, *Eyewitness V2 English Subbed*, Vimeo (June 15, 2017), *at* https://vimeo.com/221239794 ("As an initiative of the International Bar Association, we know the legal requirements for photos and videos to be admitted as evidence in court. Recognizing the immense risks eyewitnesses take we believe these efforts should never be in vain and potential evidence should always be admissible in a court of law."); Harlo Holmes, *Making Cameras Count*, YouTube (Oct. 24, 2013), *at* https://www.youtube.com/watch?v=lzjoAdhAKWU (describing encryption and metadata features of the CameraV app that enable authentication).

[6] *See* Robert Chesney & Danielle Citron, *Deep Fakes: A Looming Crisis for National Security, Democracy and Privacy?*, Lawfare (Feb. 21, 2018), *at* https://lawfareblog.com/deep-fakes-looming-crisis-national-security-democracy-and-privacy (describing DeepFakes as the "digital manipulation of sound, images, or video to impersonate someone or make it appear