HARVARD Kennedy School
CARR CENTER
for Human Rights Policy

Human Rights & Technology in the 21st Century

CONFERENCE REPORT

Carr Center for Human Rights Policy
HARVARD KENNEDY SCHOOL

Introduction

ON NOVEMBER 3 - 4, 2016, the Carr Center for Human Rights Policy at the Harvard Kennedy School hosted a symposium that aimed to:

1. Strengthen collaboration among stakeholders working on issues at the intersection of human rights and technology and

2. Deepen our understanding of the nature of collaboration among different technical and scientific communities working in human rights.

The symposium brought together practitioners and academics from different industries, academic disciplines and professional practices. Discussion centered on three clusters of scientific and technical capacities and the communities of practice associated with each of them. These clusters are:

- GEOSPATIAL TECHNOLOGY: The use of commercial remote sensing satellites, geographical information systems (GIS), unmanned aerial vehicles (UAVs) and geographical positioning satellites (GPS) and receivers to track events on earth.

- DIGITAL NETWORKS: The use of digital platforms to link individuals in different locations working towards a common goal, such as monitoring digital evidence of human rights violations around the world. It often involves crowdsourcing the collection of data over digital networks or social computation – the analysis of data by volunteers using digital networks.

- FORENSIC SCIENCE: The collection, preservation, examination and analysis of evidence of abuses and crimes for documentation, reconstruction, and understanding for public and court use. Among the more prominent evidential material in this area includes digital and multimedia evidence as well as corporal and other biologic evidence. When considering the use of digital technologies, we might say that forensic science involves the recoding of material objects into binary code. This domain includes massively parallel DNA sequencing technologies as well as document scanning and data management technologies.

In their landmark 1998 book, *Activists Beyond Borders*, Kathryn Sikkink and Margaret Keck wrote that "by overcoming the deliberate suppression of information that sustains many abuses of power, human rights groups bring pressure to bear on those who perpetuate abuses" (Keck and Sikkink, 1998, Kindle Locations 77-78). The Carr Center's symposium on technology and human rights explored the ways modern human rights organization use science and technology to overcome the deliberate suppression of information.

Speakers discussed the latest advances in each of the key technologies represented at the symposium and used today by human rights organizations.

Steven Livingston and Sushma Raman co-organized the event. Livingston is Senior Fellow at the Carr Center and Professor of Media and Public Affairs and Professor of International Affairs at the George Washington University; Raman is the Executive Director of the Carr Center at the Harvard Kennedy School of Government.

CONFERENCE SCHEDULE

THURSDAY, NOVEMBER 3, 2016

WELCOME AND INTRODUCTORY REMARKS 9:00-9:45 AM

Academic Dean Archon Fung welcomed participants to the Harvard Kennedy School. The Carr Center's Academic Director Douglas A. Johnson and Executive Director Sushma Raman also offered introductory remarks. Carr Center Senior Fellow Steven Livingston introduced the conference's overarching themes and objectives.

Speakers:

- Douglas A. Johnson, Faculty Director, Carr Center for Human Rights
- Archon Fung, Academic Dean, Harvard Kennedy School
- Sushma Raman, Executive Director, Carr Center for Human Rights
- Steven Livingston, Senior Fellow, Carr Center for Human Rights

RECENT AND ANTICIPATED TECHNOLOGICAL ADVANCES 10:00 AM - 1:45 PM

What are the latest advances in each of the key technologies represented at the symposium and used today by human rights organizations? The opening sessions provide insights into recent advances in remote sensing, geographical information systems, data science, and forensic science.

REMOTE SENSING/GIS 10:00-11:00 AM

Speakers:

- Rhiannan Price, Senior Manager, Global Development Program, DigitalGlobe
- Jim Beckley, Vice President, Sales & Business Development, Black Sky
- Kevin O'Connell, President and CEO, Innovative Analytics & Training & Outgoing Chair of NOAA's Federal Advisory Committee on Commercial Remote Sensing (ACCRES)
- Moderator/discussant: Scott Edwards, Senior Adviser, Amnesty International's Research Directorate

DIGITAL NETWORK ANALYSIS 11:00-12:00 PM

Speakers:

- Hend Alhinnawi, Co-Founder, Syria Tracker, a project of Humanitarian Tracker
- Taha Kass-Hout, Co-Founder, Syria Tracker, a project of Humanitarian Tracker
- Christopher McNaboe, Manager, Syria Mapping Project, Carter Center
- Francesco Sebregondi, Research Fellow, Forensic Architecture
- Moderator/discussant: Bryan Nuñez, Program Officer, Open Society Human Rights Initiative

FORENSIC SCIENCE 12:45-1:45 PM

Speakers:

- Stefan Schmitt, Director, International Forensic Program, Physicians for Human Rights
- Victor Weedn, Chair and Professor, Department of Forensic Sciences, George Washington University
- Thomas Parsons, Director of Forensic Sciences, International Commission for Missing Persons
- Moderator/discussant: Kate Doyle, Senior Analyst of U.S. policy in Latin America, National Security Archive

CHALLENGES AND OPPORTUNITIES IN COLLABORATIONS ACROSS TECHNOLOGIES 2:00 -3:30 PM

Today, scores of commercial high-resolution satellites are available to human rights organizations. Additionally, social media and other digital platforms sometimes offer information that help investigators understand an event. And forensic science organizations now have access to sequencing technology that undermine efforts to thwart the identification of remains, such as the disassociation of remains by exhumation and reburial. What are the opportunities and challenges associated with the "digitization" of human rights investigations?

Speakers:

- Thomas Parsons, Director of Science and Technology, International Commission for Missing Persons
- Isaac Baker, Imagery Analysis Manager for the Signal Program at the Harvard Humanitarian Initiative, Harvard University

- Jos Berens, Project Design & Delivery, Data Responsibility, Humanity X & coordinator of the Data Governance Working Group at NYU GovLab and Leiden University's Peace Informatics Lab, Centre for Innovation
- Jonathan Drake, Senior Program Associate with the Geospatial Technologies Project, Scientific Responsibility, Human Rights and Law Program, American Association for the Advancement of Science
- Moderator/discussant: Josh Lyons, Satellite Imagery Analyst, Human Rights Watch

THE CHALLENGE OF UBIQUITOUS DEVICES AND THE DELUGE OF DATA 3:30-5:00 PM

Nearly ubiquitous Internet-enabled mobile telephony with cameras means that bystanders and victims of human rights abuses can collect and disseminate information and images in real-time. The challenge to researchers is finding evidence and verifying its authenticity. How can massive amounts of user generated content be managed in a timely, actionable way without causing injury to already vulnerable populations? How might data science and predictive analytics affect the use of remote sensing? What might be the role of crowdsourcing in data analytics?

Speakers:

- Scott Edwards, Senior Adviser, Amnesty International's Research Directorate
- Francesco Sebregondi, Research Fellow, Forensic Architecture
- Tanya Karanasios, Deputy Program Director, WITNESS
- Josh Lyons, Satellite Imagery Analyst, Human Rights Watch
- Moderator/discussant: Jay Aronson, founder and director of the Center for Human Rights Science at Carnegie Mellon University

FRIDAY, NOVEMBER 4, 2016

THE LEGAL OPPORTUNITIES AND CHALLENGES OF THE USE OF TECHNOLOGY IN HUMAN RIGHTS INVESTIGATIONS 9:00 – 10:30 AM

Remote sensing, DNA sequencing, and data mining have emerged as valuable techniques for investigating and gathering evidence of human rights abuses and war crimes. Collecting evidence sometimes poses legal and moral concerns concerning privacy intrusions and questions concerning the state's search and seizure authority. Furthermore, establishing and maintaining the chain of custody of the evidence may be difficult. In the view of some critics, human rights investigations have not been sufficiently rigorous in protecting data. Moving forward, we can expect that the examination and analysis of evidence by forensic experts will be subject to judicial scrutiny and the court of public opinion. In fact, the scientific validity of some forensic methods has been called into question already (PCAST, 2016). Experience and expertise may not be sufficient against courtroom challenge, particularly when the stakes are high. However, trials will often depend upon this scientific and technical evidence. The wealth of information garnered between these three techniques together should establish solid cases for the prosecution of crimes. The exhumation of mass graves is one practice that might benefit from bringing areas of expertise together. Satellite imagery, for example, locates where the earth has been disturbed, suggesting possible mass graves, while DNA sequencing helps identify the dead once (if) they are exhumed. Information parsed from the Internet (whether videos uploaded to YouTube, photographs shared on social media, or communications posted to Twitter and other platforms) can also provide important contextual information that corroborates information collected by satellites. In this session, we explore how these technologies are currently used in concert (or not) and how such collaborations might be improved to support legal accountability in the future.

Speakers:

- Victor Weedn, Chair and Professor, Department of Forensic Sciences, George Washington University
- Alexa Koenig, Executive Director, Human Rights Center and Lecturer-in-Residence at UC Berkeley School of Law
- Keith Hiatt, VP, Human Rights Program, Benetech
- Theresa Harris, Senior Program Associate, AAAS Scientific Responsibility, Human Rights and Law Program
- Moderator/discussant: Sushma Raman, Executive Director, Carr Center for Human Rights Policy

THE PROMISE OF DNA SEQUENCING 10:30 AM -11:45 AM

While DNA databases are now well established in many countries in the world, rules on their use vary. As DNA technology advances and becomes more accessible, new databases are being established while existing databases are expanding. In some countries, DNA databases of the entire population are under consideration. Data-sharing across international borders is also on the increase. How do we harness this opportunity in an ethical and responsible way?

Speakers:

- Stefan Schmitt, Director, International Forensic Program, Physicians for Human Rights
- Daniele Podini, Associate Professor, Department of Forensic Sciences, The George Washington University
- Thomas Parsons, Director of Science and Technology, International Commission on Missing Persons
- Moderator/discussant: Jay Aronson, Founder and Director of the Center for Human Rights Science, Carnegie Mellon University

DATA AND THE COURT OF PUBLIC OPINION 1:30-3:00 PM

Standard models of human rights advocacy highlight the role of information in creating political pressure directed toward those who abuse human rights. Today, information technologies and advances in data visualization technologies, open new avenues for mobilizing publics and for pressuring human rights abusers. What are the advantages and limitations of developments? Data visualization typically requires gathering and processing large amounts of data. Who performs this task for often understaffed and inadequately equipped human rights investigators? What concerns spring from this requirement?

Speakers:

- Rhiannan Price, Senior Manager, Global Development Program, DigitalGlobe
- Christopher McNaboe, Manager, Syria Mapping Project, The Carter Center
- Hend Alhinnawi, Co-Founder, Humanitarian Tracker
- Taha Kass-Hout, Co-Founder, Humanitarian Tracker
- Moderator/discussant: Tanya Karanasios, Deputy Program Director, WITNESS

THE FUTURE OF HUMAN RIGHTS 3:15 -4:45 PM

The beginning of the symposium was spent reviewing the latest developments in remote sensing/GIS, data mining, and forensic science, especially DNA sequencing technology. What is the future (5 and 10 years hence) of technology in human rights investigations? Given what we have considered to this point in the symposium, what will data integration from across different data sources look like moving forward? What are the technical, operational, organizational, legal, and ethical opportunities and challenges to collaborative investigations and operations? After brief opening remarks by our panelists (about 5 minutes each) the conversation will be open to all participants.

Speakers:

- Scott Edwards, Senior Adviser, Amnesty International's Research Directorate
- Alix Dunn, Executive Director and Co-Founder, The Engine Room
- Kevin O'Connell, President and CEO, Innovative Analytics & Training and Outgoing Chair of NOAA's Federal Advisory Committee on Commercial Remote Sensing (ACCRES)
- Alexa Koenig, Executive Director, Human Rights Center and Lecturer-in-Residence at UC Berkeley School of Law
- Kate Doyle, Senior Analyst of U.S. policy in Latin America, National Security Archive
- Josh Lyons, Satellite Imagery Analyst, Human Rights Watch
- Moderator/discussant: Sushma Raman, Executive Director, Carr Center for Human Rights Policy

CLOSING REMARKS

Speakers:

- Kathryn Sikkink, Ryan Family Professor of Human Rights Policy at HKS and the Carol K. Pforzheimer Professor at the Radcliffe Institute for Advanced Study
- Steven Livingston, Senior Fellow, Carr Center for Human Rights Policy, Harvard Kennedy School, Harvard University and Professor of Media and Public Affairs (School of Media and Public Affairs) and Media and International Affairs (Elliott School of International Relations), George Washington University

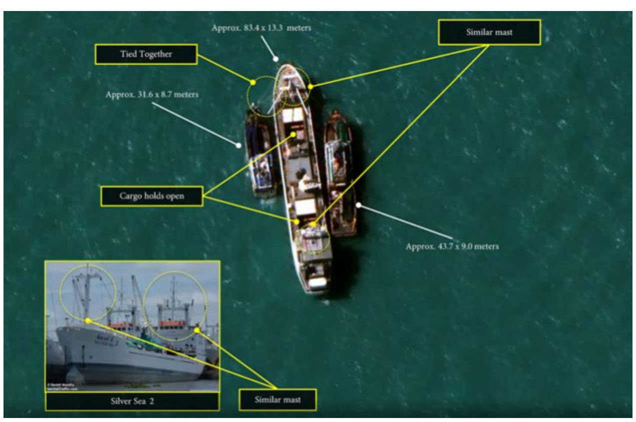
CONFERENCE PROCEEDINGS

REMOTE SENSING / GIS

RHIANNAN PRICE, Senior Manager, DigitalGlobe

Price provided background information on DigitalGlobe, one of the world's leading high-resolution satellite imaging companies. Satellites have an array of sensors onboard, some of which capture images of objects on the ground as small as home plate on a baseball diamond. Price offered the example of the Associated Press use of satellite imagery to investigate human trafficking in Papua New Guinea (Mendoza et al, 2016). DigitalGlobe imagery has been used by leading human rights organizations to track the destruction of villages by Boko Haram in northern Nigeria, mass graves in Burundi, the destruction of villages in Iraq, and war crimes in Darfur (Smith-Spark and Robertson, 2015; Kron, 2016; Amnesty International 2016) . Price discussed industry trends related to satellite imagery, including the trend toward smaller satellites with improved revisit rates. This refers to the time it takes for the same satellite, or one with similar instruments, to return to a previously "sensed" location. Rapid revisit cycles are important for change detection: determining what has changed in a scene over time. Because of the massive archives of storage images, analysts can, in a sense, go back

DIGITALGLOBE ANALYSTS SPOTTED A HIGH-RESOLUTION SHOT OF A SHIP MATCHING THE SILVER SEA 2 RIGHT DOWN TO THE DOCKING ROPES AND OPEN CARGO HOLDS, WITH BOATS IDENTICAL TO THOSE FROM BENJINA NESTLED ALONGSIDE, APPARENTLY OFFLOADING FISH.



THE PROOF COMES FROM ACCOUNTS FROM RECENTLY RETURNED SLAVES, SATELLITE BEACON TRACKING, GOVERNMENT RECORDS, INTERVIEWS WITH BUSINESS INSIDERS AND FISHING LICENSES. THE LOCATION IS ALSO CONFIRMED IN IMAGES FROM SPACE TAKEN BY ONE OF THE WORLD'S HIGHEST RESOLUTION SATELLITE CAMERAS, UPON THE AP'S REQUEST.

in time to compare contemporary images of a location with archival images. "When exactly was that plot of ground overturned and how close is it to a report of a massacre?" Price also spoke of the evolving market forces in the satellite industry and how DigitalGlobe is responding to growing competition from both American and several overseas firms. Imagery is less expense and more readily available from several providers. She also spoke of new data analytics that push the analysis of huge amounts of geospatial data into automated services, such as change detection done by computers. "Ground-truthing" analyses of images – when possible, gathering evidence from the ground – is always helpful. DigitalGlobe's recent purchase of RaidiantBlue Technologies, a data mining firm that looks for relevant information on social media platforms, local media reports and other ground-based sources of information, allows it to "converge data using location intelligence and multiple technologies." New business models and data licenses, subscription models and data sharing options are expanding the reach of remote sensing imagery in the civilian sector.

JIM BECKLEY, VP Sales & Business Development, BlackSky.

Beckley began with a description of BlackSky, an emerging commercial remote sensing satellite company with a planned constellation of 60 satellites with one-meter sensors. As a point of comparison, DigitalGlobe's most powerful satellites offer 30-cm resolution. Once completed, BlackSky's constellation of one-meter imaging satellites will have much better revisit frequencies, with comparable satellites returning to most places within ten minutes of each other. The satellites will provide coverage over 95% of the Earth's population. BlackSky is addressing barriers to the use of satellite imagery, by reducing price and increasing coverage.

> *Once completed, BlackSky's constellation of one-meter imaging satellites will have much better revisit frequencies, with comparable satellites returning to most places within 10 minutes of each other. They will provide coverage over 95% of the earth's population.*

BlackSky's global event monitoring system uses machine learning to look for anomalies and then cross-references them with social media, news stories, and other data sources to provide a holistic view of the situation. In other words, a combination of computer and human analysis look for evidence of significant events captured by satellite imagery and then corroborate analyses with additional information from other sources.

KEVIN O'CONNELL, President & CEO of Innovative Analytics and Training and the past chairman of the National Oceanic and Atmospheric Administration's Federal Advisory Committee on Commercial Remote Sensing.

O'Connell described the unprecedented global transparency, due in part to information technologies such as remote sensing and GIS. He also discussed the policy and regulatory issues of concern in this rapidly shifting landscape. He described the revolution in data collection due to diverse overhead collection platforms, the wide range of geospatial data available, and the multiple sources of imagery data, as well as the revolution in data analysis that allows for low-cost replication and distribution of imagery, improved analytical methods, crowdsourcing of geospatial data, and growing NGO expertise in using remote sensing. He also highlighted the use of satellite imagery data by NGOs for humanitarian and human rights issues, with implications for the democratization and greater transparency of data. Examples include: Amnesty International uses satellite images to highlight human rights abuses; Center for Strategic and International Studies' Asia Maritime Transparency Initiative monitors developments in the South China Sea; Satellite Sentinel Project focuses on conflict in South Sudan.

He discussed the issue of broad public access to technologies that were previously accessible to only select governments. This is especially germane in relation to the lag in policy and regulation relative to the rapid growth in technological innovation. He also noted that with the growing availability of low-cost imagery there is a risk of misinterpretation of images. Technological innovation far outpaces the government's ability to respond with appropriate regulations and policy.

The session described the current and emerging capacities and reach of remote sensing satellite companies, as well as the public policy, regulatory, and ethical questions that arise in a rapidly changing field where greater transparency and access, combined with more competitive pricing, can both benefit human rights and humanitarian organizations and the communities they support, and increase the power of governments and non-state actors to conduct surveillance over communities.

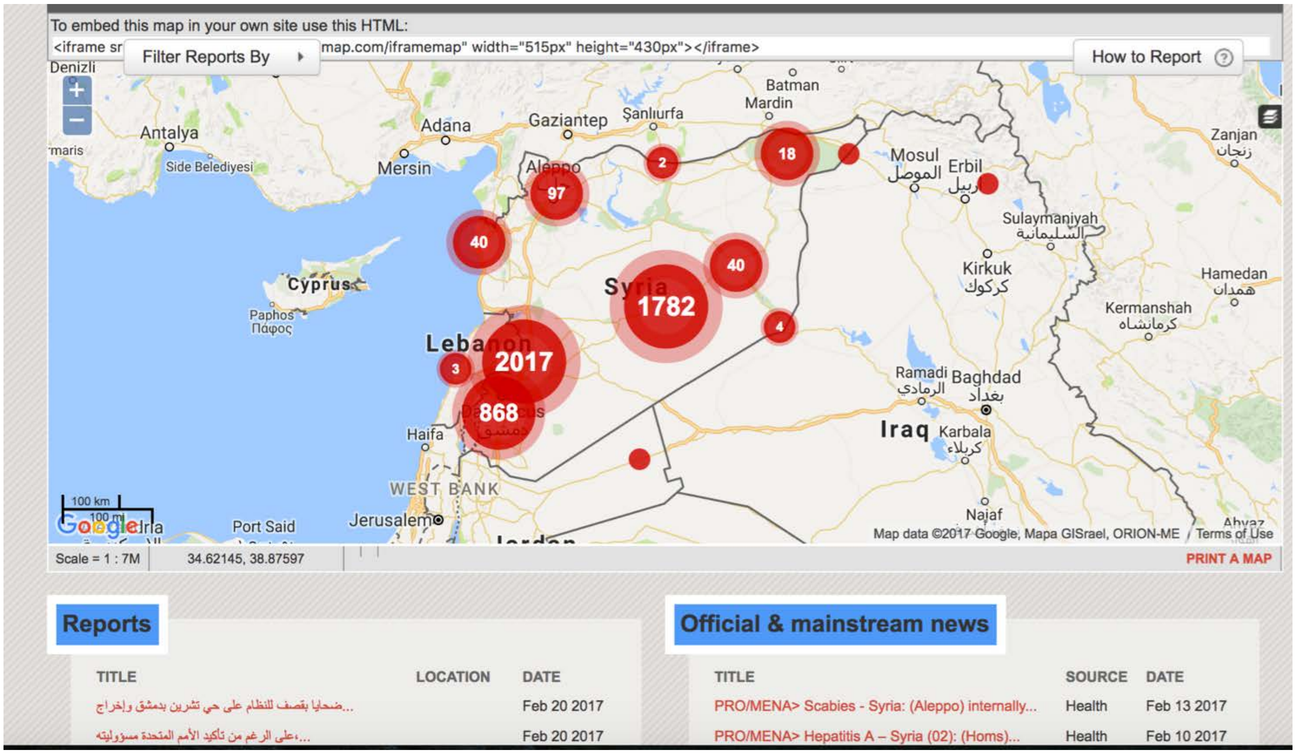
DIGITAL NETWORK ANALYSIS

Digital networks are important to human rights monitoring and documentation in two ways: First, human rights groups can "mine" the vast amount of information found on social media platforms as they look for evidence of abuse. Every minute another 300 hours of video is uploaded to YouTube, with estimates pointing to an increase to 500 hours a minute in the near-term (Robertson, 2014). According to analysts at Statistic Brain, a research firm, an average of 58 million tweets are sent each day. Facebook's 1.7 billion users (as of November 2016) share approximately 1 million links to other Internet content every 20 minutes. Some small percentage of all that content is germane to human rights abuse investigations. How to find that needle in the haystack? That is a part of the challenge.

Another way digital networks are important to human rights organizations is found in the ability to mobilize volunteer human analysts who examine small batches of a large data set, such as an aerial or satellite image of an entire region. A single volunteer might review a dozen meters of terrain captured in a larger image of the entire region. With thousands of volunteers, significant amounts of terrain can be analyzed in detail. Amnesty International's Decode Darfur offers an example. Volunteers monitor and tag – identifying key features, such as evidence of damage to homes – images. In some cases, human coders train computers to identify patterns. Computer algorithms are strengthened by inputs from humans looking at images. In both crowdsourcing inputs into an event monitoring platform and in crowdsourcing the analysis of an existing data set, digital networks leverage the scalability and low costs of digital networks.

HEND ALHINNAWI and **TAHA KASS-HOUT**, co-founders of Syria Tracker.

Alhinnawi and Kass-Hout described how Syria Tracker captures a steady stream of inputs that are crowd-sourced from people caught in the Syrian crisis, and from over 2,000 news sources and online content (Twitter, Facebook, YouTube, etc.). Syria Tracker displays this information on a digital map with layers of events tagged with meta data and arrayed geospatially and chronologically. Syria Tracker is sometimes referred to as the longest serving crisis map in existence. Quality control is essential. Only 6% of the 150,000 crowd sourced reports to date have been published. This low percentage highlights the strict standards for determining the validity of information received by Syria Tracker. Their reports cover killings, missing people, rape, use of chemical weapons, and refugees. It even helped report 47 massacres not recorded by the media or other humanitarian organizations.



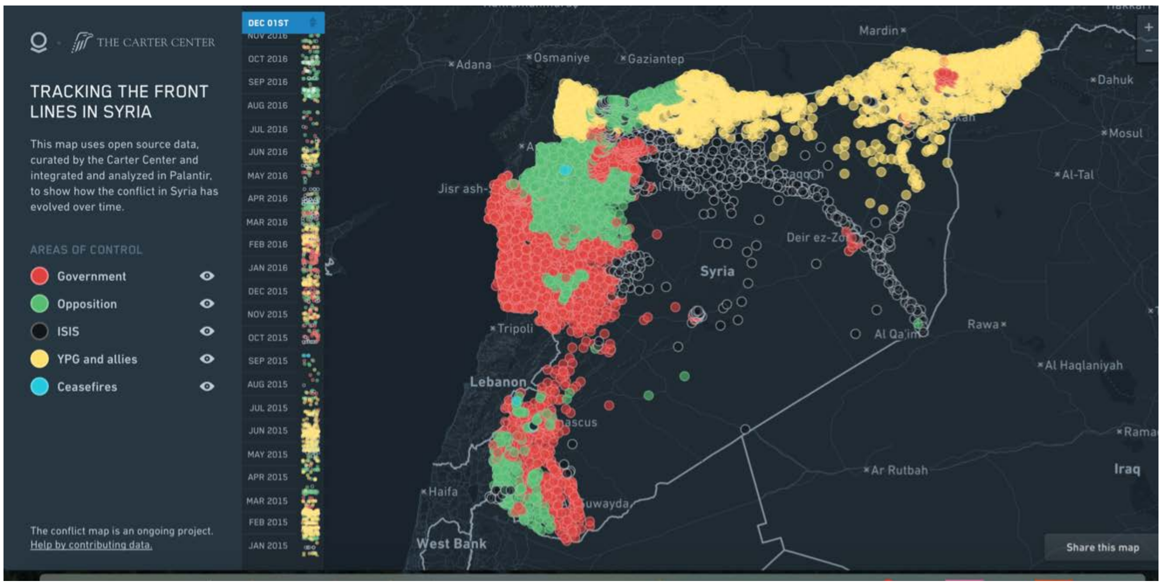
A SCREENSHOT FROM SYRIA TRACKER'S WEBSITE

Syria Tracker has shed a light on other unreported issues, such as the first case of polio that re-emerged in Syria. Alhinnawi and Kass-Hout also described the "death routes" – the tracking of drownings and exhaustion-related deaths in the Mediterranean, as well as the increasing proportion of females being killed in Syria, due to civilians being targeted. Syria Tracker illustrates the important role of crowdsourcing, network data analysis, and data visualization in human rights documentation.

CHRISTOPHER MCNABOE, Developer/Manager of the [Syria Conflict Mapping Project](), Carter Center

McNaboe described the [Carter Center's investigation]() of user generated or crowd sourced materials. He shared examples of Syrian defectors using YouTube to announce their intent. The Carter Center started tracking individuals' defections through these online videos. In this way,

THE CARTER CENTER TRACKED OVER 4,000 UNIQUE GROUPS AND OVER 100,000 INDIVIDUAL FIGHTERS WHO WERE VISIBLE IN THE FOOTAGE.



The network map reveals no logical center; However there are a couple large clusters. In the center there is a giant mass of independent groups that were not picked up in larger group formations. While the Carter Center's initial goals were around mediation and negotiation, the video analysis revealed that this would be challenging due to the many groups that were created, the lack of clarity around whether these groups still exist, and uncertainty about the relationships between the various groups and factions. The Center started tracking conflict events and relating them to the groups and then building early warning systems and predictive models for monitoring conflicts and strengthening humanitarian responses.

the Carter Center gleaned information about the defectors, the number of people present at the announcement (a measure of the magnitude of the defection), the name of the spurned organization and the name of the newly adopted organization. A sense of the defector's aims could be discerned from their statements. Identifying information could be gleaned, too, by paying attention to the type of clothing worn by defectors and their supporters, as well as relevant background information, such as flags and geographical terrain. In this way, the Carter Center visualize the presence of armed groups throughout Syria. There were over 230 armed groups formed just in the month of December 2015. The Carter Center tracked over 4,000 unique groups and over 100,000 individual fighters who were visible in the footage.

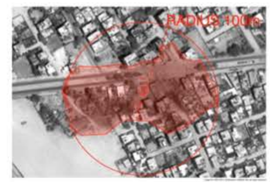
The network map reveals no logical center or core hub. Instead, it reveals a couple large clusters. In the center of the network one sees a giant mass of independent groups that were not included in larger group formations. While the Carter Center's initial goals were around mediation and negotiation, the video analysis revealed that this would be challenging due to the many groups that were created, the lack of clarity around whether these groups still exist, and uncertainty about the relationships between the various groups and factions.

FRANCESCO SEBREGONDI, Research Fellow, Forensic Architecture

Sebregondi demonstrated the use of geospatial techniques for reconstructing events, such as the bombing of Rafah, Gaza in 2014, by knitting together data from remote sensing satellites and from hundreds of videos and images (Forensic Architecture and Amnesty International, undated). Forensic Architecture's work illustrates the use of geospatial data as a digital three-dimensional space in which data from nearly ubiquitous cameras are arrayed. Video and still images were fitted in a three-dimensional digital model of Rafah. By triangulating images of buildings, shadows and bomb smoke plumes, the exact angle, time and circumstance of the attack on this high-density civilian population centers were verified in the reconstruction.

> *Videos show dispersed fragments of data, which constitute the new media landscape through which war is waged. We use network analysis to create one unified narrative and tell one story of what happened. We approach this from two perspectives: the microanalysis of events of one single day and the macro patterns from the analysis of massive data.*

The complex geographic relationships between different camera angles, buildings, shadows and even the morphology of smoke plumbs, allowed Forensic Architecture to reconstruct events on the 1st of August 2014, the deadliest day of the 2014 Israeli military incursion into Gaza. Forensic Architecture was able to identify falling missiles by analyzing video just fractions of seconds before impact. By suspending munitions in space fractions of a second before impact, the exact type of missile and the origin of their manufacturer was identified by its visible nomenclature. A commercial satellite image also captured one of the explosions caused by an incoming Israeli missile. Because of the precise awareness of the moment the satellite image was taken, it not only captured an image, it also provided a time stamp for verifying the exact time and location of the same explosion captured by amateur video footage. Measuring the angles of shadows cast on the ground and on buildings allowed Forensic Architecture to determine the exact time of the bombing and recreate the rhythm of the image sequence, per the changing shape of the plume.



A VIDEO CAPTURE FROM SEBREGONDI'S PRESENTATION

Videos show dispersed fragments of data, which constitute the new media landscape through which war is waged. Forensic Architecture also uses network analysis to create one unified narrative and tell one story of what happened. It approaches this from two perspectives: the microanalysis of events of one single day and the macro patterns from the analysis of massive data.

FORENSIC SCIENCE

Forensic science was among the first scientific fields to be involved human rights investigations. Forensic anthropologists looked for clues from the graves and from the victim's remains. Clyde Snow, the famed forensic anthropologist credited with introducing forensic science to human rights investigations, once remarked, "The homicidal state shares one trait with the solitary killer. Like all murderers, it trips on its own egotism and drops a trail of clues which, when properly collected, preserved and analyzed, are as damning as a signed confession left in the grave" (Guntzel, 2004).

The central objective of forensic anthropology is discovering those clues. Investigations now include forensic pathology and other forensic science disciplines. They have evolved from an anthropologist using simple handheld measuring devices to multidisciplinary teams using sophisticated instrumentation, including genetic analyzers and DNA sequencers to precisely identify bodies. Rather than requiring largely intact graves and remains, even small fragments of bone can, in some cases, be used to extract a sample for sequencing. When a reporter once asked about the tools of his trade, Snow retrieved a worn leather bag containing several items. He had an anthropometer used to determine stature by measurement of the longer bones. "We can usually get within two or three inches" he explained. Snow also had a sliding caliper used to measure skulls. A Boley gauge was used to measure teeth. A simple measuring tape was used for measuring a skull circumference and a spreading caliper to measure head length or head breadth. Shovels, brushes, and even chopsticks were also used to exhume bodies and look for other clues, such a shell casings and the other detritus of a murder scene. "Most of the time we can determine whether the person was right-handed or left-handed" by looking at the wear patterns on bones (Guntzel, 2004). More wear is found on the arm and hand bones of the dominant hand. The parturition history of females can be sometimes discerned by the remodeling that occurs in the bones of the pelvis during childbirth. "What we're trying to do is reconstruct a life history of the person from the evidence preserved in the skeleton" (Guntzel, 2004). This includes the cause of death. "In these cases of the disappeared in Argentina, about 80 to 90 percent had a single gunshot wound to the back of the head. You see a lot of that" (Guntzel, 2004

In July 1996, approximately 8,0000 men and boys were massacred by Serbian nationalist forces in Srebrenica. The victims were buried in mass graves. Later that year, Bosnian Serbs used earthmoving equipment to dig up, mix together, and rebury the remains in several other pits. The condition of the remains overwhelmed the capacity of conventional forensic anthropology to find clues from the bones alone.

Thomas Parsons of the International Commission for Missing Persons explains his organization's work in Srebrenica in his presentation discussed here. The same conditions were found in other high-profile mass casualty events, such as the twin towers in New York attacked on 9/11 2001. Intense heat and jet fuel made many of the remains impossible to identify by conventional methods. The 2004 tsunami in the Indian Ocean also presented new challenges for identifying large numbers of fatalities in harsh conditions. Hurricane Katrina presented similar challenges. A systematic matching of genetic profiles was the only viable solution to sorting out the thousands of fragments and disarticulated skeletal remains. In Bosnia, once an identification was made, notes anthropologist Sarah Wagner, classical forensic methods "would again enter into the identification process, typically confirming or augmenting the statistical evidence of the DNA profile match" (Wagner, 2008, p. 102).

Standard anthropological methods and digital DNA sequencing technology are now used by human rights organizations to identify remains and to construct narratives about the identities and deaths of "disappeared" persons, even when remains are damaged and disassociated. In addition to the tools used by Snow and other forensic anthropologists, forensic scientists like Daniele Podini use desktop digital instruments like ThermoFisher Scientific's Ion S5™ XL System. It relies on microchip technology that translates chemical characteristics of the sample into binary code. Though rather complicated to the layperson, fairly accessible explanations of the process are available online.

STEFAN SCHMITT, Director of the International Forensic Program at Physicians for Human Rights (PHR)

PHR INTERNATIONAL FORENSIC PROGRAM DIRECTOR STEFAN SCHMITT EXAMINES EVIDENCE AT A WAREHOUSE IN TRIPOLI, LIBYA

Schmitt noted that physical access and security are potential obstacles to successful recovery and identification of bodies. Researchers often document features and information during such forensic identification with field notes.

Schmitt noted that nonprofit organizations intervening and collecting evidence in such contexts often do not have jurisdiction over what they are trying to do, i.e. collect evidence. "This makes things challenging," he explains, "since we don't have clear rules of evidence, or a court with rules we can follow." He underscored the urgency of making evidence documentation as credible as possible in such forensic investigations, so that it might be utilized one day in court as evidence. He also discussed evidence linkage theory: should a satellite image capture a patch of disturbed earth it must be linked to physical evidence on the ground. "We are trying to identify a suspect, victims, and the crime scene in and of itself. The whole purpose of this is so that we can crosslink different elements at some stage down the road." Satellite images must therefore be linked to this process to be of value. Issues concerning chain of custody of evidence are also important. It involves remote sensing, notes taken in the field, including measurements and sketches made in the field, anything having to do with an investigation and evidence.

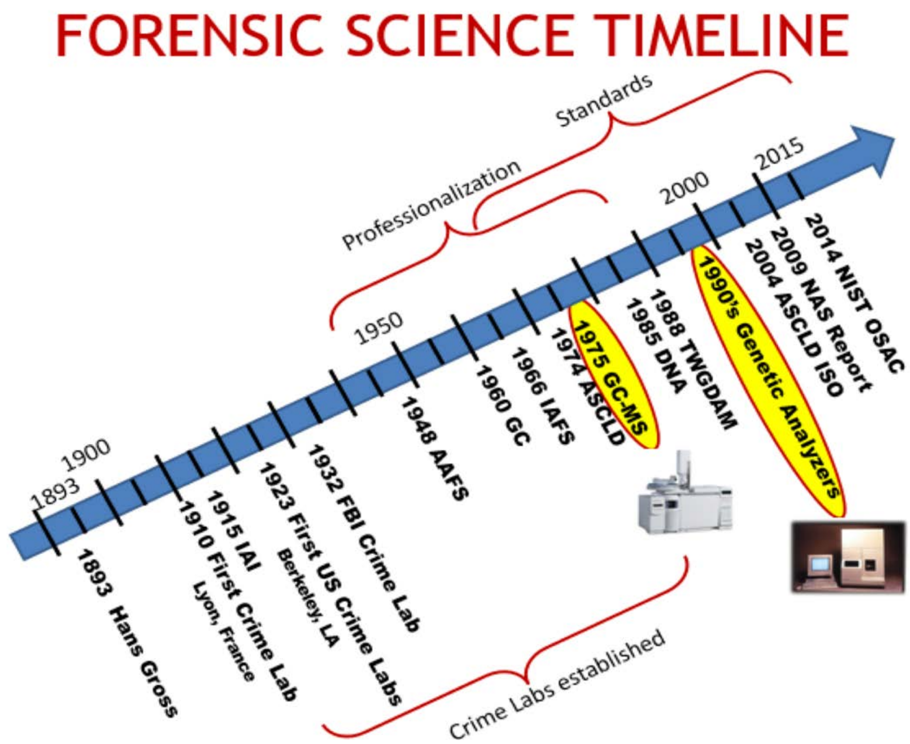
> *"We are trying to identify a suspect, victims, and the crime scene in and of itself. The whole purpose of this is so that we can crosslink different elements at some stage down the road."*

Chain of custody is more than just a series of receipts, signatures and awareness of how materials are being handed over. It is much more complex than that. Forensics is the application of the scientific method to answer questions that might be used in a court of law. Evidence in the forensic sense has a more nuanced or precise meaning than what one sometimes finds in the human rights domain when referring to the court of public opinion. Rules of evidence vary in court systems around the world. But in general, chain of custody involves questions about the origins of evidence and questions about the people and organizations that have held evidence in its possession.

VICTOR WEEDN, Chair and Professor, Department of Forensic Sciences at George Washington University

Weedn, a physician, medical pathologist, and an attorney, explained the technological transformation of forensic science. He noted that even today, most perpetrators of crimes are identified by eyewitnesses and by confessions. Yet what we know now -- something that has become particularly clear in the last two decades -- is that both eyewitness accounts and even confessions are fallible and untrustworthy. Forensic science has entered the picture as a powerful and objective third way of identifying a perpetrator. However, the criminal justice system is still adapting to this new type of evidence. We tend to forget just how new forensic science is.

Hans Gross's 1893 handbook of forensic science is considered the start of forensic science as a discipline (Gross, 1893). Crime labs were established in the first half of the 20th Century and professional organization occurred in the later half. The American Academy of Forensic Sciences (AAFS) was organized in 1948. Standardization efforts proceeded from the 1970s, and continue today. In the mid 1970's, highlighted in yellow on the timeline above, the gas chromatography mass spectrometer (GC-MS) was introduced as the primary chemistry analyzer still present in forensic laboratories today.



COURTESY OF VICTOR WEEDN

DNA instrumentation was not introduced until the 1990s. But it isn't the tools as much as it is the data bases that make modern forensic science powerful. The three big databases in forensic science are DNA, fingerprints, and firearms—they allow the identification of a perpetrator or weapon without further police investigation. Bullets, casings, fingerprints, and DNA are commonly found at scenes. DNA technology has become so sensitive that invisible DNA traces from drinking glasses and even handled objects can now be analyzed. These can be searched again growing DNA data bases. Incomplete matches may identify family members of someone that is not in the data base. DNA technology can also be used to reveal the same sort of information now found on a driver's license: gender, eye color, hair color, height, age, and ethnic ancestry. Recently, proteins from hairs with little DNA have used to reveal genetic identity information. Elsewhere, forensic science has also advanced. Mass spectrometry instrumentation is ever more powerful. Various chemistry and even DNA instruments have been made smaller and portable enabling field analytics. Digital forensics seems limitless in application. However, the full potential of these forensic science advances has yet to be realized in human rights investigations.

THOMAS PARSONS, Director of Forensic Sciences, International Commission on Missing Persons

ICMP now operates under a treaty charter agreement that gives it diplomatic privileges that allow it to hold information that is immune from forfeiture by legal means.

> *ICMP played a leading role in the identification of civilians massacred in Srebrenica in the summer of 1996 by Serbian nationalist forces, buried in mass graves. Declassified satellite imagery – Srebrenica occurred before high-resolution commercial satellites existed – was turned over to the special criminal tribunal that had been established for the former Yugoslavia. Once this information hit the media, and once the perpetrators knew what the outside world knew, "they went in and tried to destroy the evidence, by hiding it, by burying the remains in about 90 secondary mass graves months after the fact."*

Parsons began his talk with a review of events in Srebrenica in the summer of 1996 that led to the execution of about 8,000 men and boys at the hands of Serbian or Serbian allied forces. The bodies were put in about five large primary graves. Declassified satellite imagery – Srebrenica occurred before high-resolution commercial satellites existed – was turned over to the special criminal tribunal that had been established for the former Yugoslavia. "Once this information hit the media, once the perpetrators knew what the outside world knew, they went in and tried to destroy the evidence, by hiding it, by burying the remains in about 90 secondary mass graves months after the fact. And once again, we see satellite imagery indicating that that had occurred." Parsons noted that one must find the graves before the work of identification can begin. The goal of ICMP is to "document the crimes, recover the bodies, identify the bodies, return them to the families, and provide justice mechanisms in association with all of that." Very often, physical access and security are issues. When assessing a grave site one documents features with field notes, as Stefan Schmitt noted in his talk.

But 3-dimensional total station mapping is also used. A stratigraphic excavation approach is also used where one goes from top down so that one is working backwards in time over the course of the construction of that grave. With expertise, one can tell quite a lot about how that grave was established. Once exhumations begin the remains are placed in a mortuary where anthropologists will examine the remains to determine age, height (stature), and "all of the traditional Clyde Snow-like identifiers" and the personal artifacts associated with remains. The traditional anthropological approach proved to be “wholly inadequate to the complexity and size of the event in Srebrenica.” When families were shown photographs of belongings taken from these bodies and asked if they belonged to their loved ones there is a 10% chance they will be correct in their response. In about 2000, these and other factors led ICMP to a DNA-led approach to identifications. High throughput DNA analysis of DNA extracted from the skeletons was compared to thousands of samples of DNA taken from living relatives of the missing. Computer programs have been developed that matches these DNA samples to a high degree of certainty.

The DNA profiling also helps piece remains back together again after the disassociation resulting from their secondary burial by the Serbs using heavy earthmoving equipment. A massive public outreach campaign encouraged family members to contribute a DNA sample that would serve as a reference point in identifying remains. Once the family reference database was populated the identifications shot up rapidly. To date, ICMP has identified over 18,000 individuals in Bosnia. Of the approximately 8,000 Srebrenica massacre victims, almost 7,000 have been identified. There is about a 96% chance that an identification can be obtained if a bone is found. This is not only a matter of DNA sequencing technology. It also requires the sophisticated use of social media and traditional media to get the word out to family members to submit a sample.

CHALLENGES AND OPPORTUNITIES IN COLLABORATIONS ACROSS TECHNOLOGIES

THOMAS PARSONS Director of Forensic Sciences, International Commission on Missing Persons

Parsons noted that ICMP interacts with many of those involved with other technologies represented at the Carr Center conference. At ICMP, an effort was made to develop a method for collecting information about a disappearance from family members. He described ICMP’s Identification Data Management System (iDMS) which includes online platforms for individuals to report a missing person, search which cases have been registered with ICMP, and identify whether ICMP has sufficient family reference samples to enable identification for a particular case. These tools were developed to respond to challenges found in gathering a consolidated list of missing persons from family members and/or witnesses, as well as triangulating raw reported data, and making it actionable. ICMP follows up on reported cases with interviews to verify information, which can then be used in a forensic context. The tool also includes a means for families to provide genetic reference samples to aid in the identification of a missing family member, within a well-defined framework of informed consent.

Recent mass migrations from the Middle East have created challenges in this respect. There are thousands of bodies in Greece and Italy that are unidentified. Yet finding family members able to contribute DNA samples for matching is challenging. Using social media to link the bodies with their origins and families is of potential value to ICMP's work. ICMP is also developing a grave locator function for iDMS. It is a way for the public to provide information as to where to find graves. A digital map allows one to drop a pin in what he or she believes is the location of a grave. The person can add additional information, such as when the grave was created and how many bodies are believed to be in the grave. This is raw and unsubstantiated information that must then be confirmed from other sources of data.

How do you triangulate this information with social media and eyewitnesses? The data should be actionable. Furthermore, those who provide information can be put at risk. Therefore, this process must be mediated by carefully considered policies that cover the process of analysis and verification, and, of course, protect the identity of individuals providing information. The process must also limit the public awareness of suspected gravesites. Otherwise, public knowledge of their location could invite their disturbance by family members in search of loved ones or by others who wish to destroy evidence. There are also laws regarding data sharing that must be respected, such as the EU prohibition against sending genetic profiles out of Europe. There is concern also about protecting personal contact information about families at risk. Despite these risks and prohibitions, the potential here is huge. The lessons learned from the remarkable success story of Bosnia and the Western Balkans point to much more that can be done in the future with integrated data and appropriately constructed public involvement.

ISAAC BAKER, Imagery Analysis Manager, Harvard Humanitarian Initiative - Signal Program.

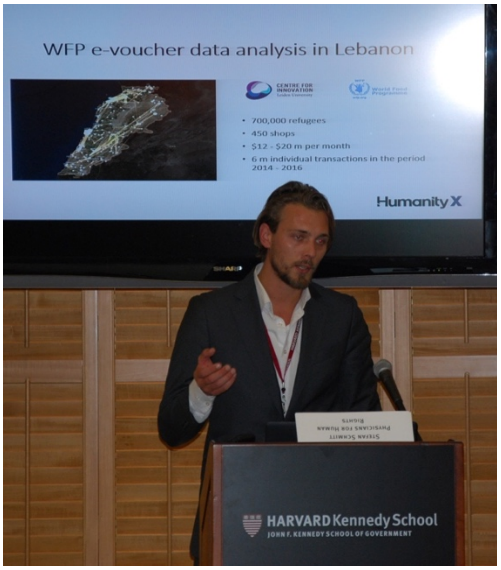
Baker described GRID, a methodology for remote corroboration of alleged mass graves, in use by Satellite Sentinel Project, a one-of-a-kind collaboration between different sectors: HHI (analysis), the Enough Project (advocacy group), Digital Globe (commercial satellite imagery), Not on Our Watch (funding), and Google. It combines satellite imagery with relevant open source data from the ground including UN situation reports and credible news reports. HHI did all the analysis. Baker notes that one of the highlights of his experience with the SSP was working with the DigitalGlobe Analysis Center and with the head of the analysis center, someone who was previously the head of image analysis at the CIA. He was also a special assistant to the director of the CIA. While this would raise red flags with some within the humanitarian community, what Baker learned from the professional analyst was very valuable to SSP's work. "They (DigitalGlobe Analysis Center) knew a lot about the conflict side of the analysis and I synthesized that and used it to do humanitarian analysis."

Satellite Sentinel Project mapped a satellite image of Kaduali, Sudan on a grid, following up on reports of systematic killings and of a potential mass grave. SSP was receiving reports of violence directed against those suspected of being aligned with the South Sudan secessionist movement. Baker stressed that the most important information SSP was getting was from the ground, not satellites. It was open-source information – a combination of UN situation reports news articles from newspapers in the Sudan. As they began to look at Kadugli more closely they realized that it was not mapped in any detail. There was no OpenStreetMap or Google map with any degree of detail. As a result, Satellite Sentinel Project had no street-level data for the town. In response, Enough Project interviewed a witness to fill in landmarks on the map and pinpoint the location of the mass grave. SSP was then able to use change detection to find trenches in a satellite image that coincided with the reports from the witness. While unable to conclude unequivocally that was the location of the mass grave, they could at least say it was consistent with reports that there were mass graves.

> *SATELLITE SENTINEL PROJECT MAPPED A SATELLITE IMAGE OF A TOWN (KADUALI, SUDAN) ON A GRID, FOLLOWING UP ON REPORTS OF SYSTEMATIC KILLINGS USING KNIVES AND OF A POTENTIAL MASS GRAVE. SATELLITE SENTINEL PROJECT HAD NO STREET-LEVEL DATA ON MAPS FOR THE TOWN. ENOUGH PROJECT INTERVIEWED A WITNESS TO FILL IN LANDMARKS ON THE MAP AND PINPOINT THE LOCATION OF THE MASS GRAVE.*
>
> *SSP WAS THEN ABLE TO USE SIMPLE CHANGE VISUAL DETECTION TO FIND TRENCHES IN A SATELLITE IMAGE THAT COINCIDED WITH THE REPORTS FROM THE WITNESS. WHILE UNABLE TO CONCLUDE UNEQUIVOCALLY THAT WAS THE LOCATION OF THE MASS GRAVE, THEY COULD AT LEAST SAY IT WAS CONSISTENT WITH REPORTS THAT THERE WERE MASS GRAVES.*

JOS BERENS, Data Responsibility Officer – HumanityX, Head of Secretariat – International Data Responsibility Group

Berens described the work of Humanity X in the effort to provide digital innovation in support of international organizations and NGOs. Humanity X is a team based in The Hague. They support organizations that want to innovate, including the World Food Program or United Nations Office for the Coordination of Humanitarian Affairs (OCHA). Humanity X provides the tools and expertise to get them to a viable prototype. As an example, Berens described the World Food Program's (WFP) rechargeable e-voucher program for food for refugees in Lebanon. The program included 700,000 refugees, 450 designated shops, and between $12 –



20 million in transactions per month. Humanity X analyzed the data, which was anonymized before being sent over a secure connection, after which it was stored on encrypted servers. The aim was to detect statistical anomalies as well as observe the patterns of movement of refugees, to provide WFP with higher quality and more timely information on the population it serves.

This project is an example of how the humanitarian data ecosystem is characterized by a variety of stakeholders (including academia, private sector, and domestic and international NGOs), with a need to collaborate to create shared value and collectively mitigate risk. No single entity can realize data-driven projects in this field by themselves. Nor can they mitigate risk on their own since they are just one link in the 'data chain'. Collaboration is called for. What makes collaborative projects difficult is that a variety of actors that might not be used to working with each other must face uncertainty together. Collaborative projects are made difficult by three types of uncertainty: What new types of data will be released? How will already existing data be analyzed (e.g. in new ways, e.g. combining datasets)? How will the context change (particularly in fragile states)? To understand the way a data ecosystem and collaboration within it deal with uncertainty, a systems approach is helpful.

> *The humanitarian data ecosystem is characterized by a variety of stakeholders (including academia, private sector, and domestic and international NGOs), with a need to collaborate to create shared value and collectively mitigate risk. Collaborative projects are made difficult by three types of uncertainty: what new types of data will be released? How will already existing data be analyzed (e.g. in new ways, e.g. combining datasets)? How will the context change (particularly in fragile states)? A systems approach is needed to mitigating these types of uncertainty.*

JONATHAN DRAKE, American Association for the Advancement of Science.
Drake described the Geospatial Technologies Project, which identifies human rights applications of high- and low-resolution satellite image analysis. The project collaborates with

human rights organizations such as Amnesty International, Human Rights Watch, and Physicians for Human Rights, as well as smaller groups such as the Karen Human Rights Group. An NGO who identifies a human rights violation that has taken place but can not pinpoint where the violation occurred requests AAAS assistance.

AAAS produces a fact-based, scientific report and partner NGOs can cite the report to back up their advocacy. Satellite imagery technology allows AAAS and human rights organizations to “access” and analyze areas they would not be able to reach in person. AAAS can cover a broad area very quickly in a way a ground-based team could not, and identify unique information not visible to human eyes. For example, satellites used by NASA to detect volcanic eruptions were used by AAAS and Amnesty International to find illegal gas flaring in the Niger Delta in Nigeria; Analysis of crater morphology in Sri Lanka in a civilian safe zone at the end of civil war in 2009 helped trace the craters back to mortar positions and to identify mortars (a Human Rights Watch and Amnesty International collaboration).

Drake described some of the challenges in using remote sensing and satellite imagery analysis. Remote sensing is powerful, but not a panacea. It is still primarily limited to still images rather than video (capacities currently only exist to analyze short duration video), and there is no “enhance” function – as seen in Hollywood movies -- to increase the level of detail on images. Ethical and security challenges abound: Does releasing imagery or coordinates expose vulnerable populations? Should data (e.g. location coordinates) be obfuscated or truncated for security reasons? Limited data can also leave organizations open to criticism. Security needs must be assessed on a case-by-case basis.

Panelists discussed the challenges in using these technologies, which were often not technical, but rather institutional—understanding different institutional mandates and responsibilities. However, collaboration between different data sources and technology types is fairly mature. They also discussed the challenge of data integrity and credibility related to organizational type and capacity.

Baker, Parsons and Lyons discuss the opportunities and challenges of new technologies for human rights.

Panel participants discussed the opportunities and challenges for human rights organizations using such technologies and collaborating with technology developers. Josh Lyons of Human Rights Watch emphasized the need for independence of human rights organizations and a need to refuse funding from governments, military agencies and contractors, and private companies engaging with repressive regimes. Human rights organizations may want data collection and analysis to be an internal capability. There may be limitations for human rights organizations engaging with such technologies, and ethical challenges because the same technologies may be used for nefarious purposes. However, by using and testing these technologies, human rights groups can contribute to enhancing these technologies and to holding violators accountable.

THE CHALLENGE OF UBIQUITOUS DEVICES AND THE DELUGE OF DATA

JAY D. ARONSON, Associate Professor of Science, Technology, and Society and Director of the Center for Human Rights Science at Carnegie Mellon University.

As moderator, Aronson begun by exploring the case of Ukraine's Maidan protests – and a collaborative project between lawyers, nonprofit actors and human rights academic through the Center for Human Rights Science at Carnegie Mellon University. Nearly ubiquitous Internet-enabled mobile telephony with cameras means that bystanders and victims of human rights abuses now collect and disseminate information and images in real-time. At the very least, sifting through the data deluge presents both opportunities and challenges to human rights investigators. Aronson explained that his Center had analyzed approximately 65 hours of primarily cell phone videos of the Maidan protests from a specific morning in February 2014. Carnegie Mellon computer scientists developed tools to automatically synchronize this video using sound signatures, accomplishing in a few days what it took an individual analyst near eight months to do. They have also developed capacities to use geotagged images from Google Streetview and other sources to semi-automatically identify the specific location where a specific video was taken. Geographic and temporal data and combining it with the video allows analysts makes it possible to reconstruct events over time and space. Aronson concluded by posing the following questions:

- How can massive amounts of user generated content be managed in a timely, actionable way without causing injury to already vulnerable populations?
- How can video data and other evidence be combined with remote sensing to better understand the sites of human rights violations?
- What might be the role of crowdsourcing in data analytics?
- How can we ensure that technologies enhance the protection and promotion of human rights, rather than hindering these efforts?

SCOTT EDWARDS, Senior Advisor, Amnesty International

Edwards began by noting the enormous volume of information that is now available. Every minute another 300 hours of video is uploaded to YouTube, and that is just one of several platforms. Data exhaust is everywhere: shopping data and CCTV are just a few more examples. Ubiquitous data are creating operational challenges. Amidst the sea of digital data, how do you find the human rights violations? This is a "noise" problem. How do you sort the food and kitten photos so heavily represented in social media from the signals, the photos that will help the human rights researcher find valuable evidence? How do you sort and secure information shared via social media? Data overload also created challenges for simply organizing and making sense of it, as well as securing it, and protecting its probative value. Evidence that is

improperly handled is worthless in a tribunal. There are also issues of scale and scope. Are we looking for that one airstrike in Gaza or are we looking for patterns and trends that would demonstrate systematic and sustained forms of abuse? These two scenarios present different data collection requirements. There are also huge challenges around verification, explained Edwards. It is sometimes difficult to get access on the ground to check if video evidence is accurate. Verification calls for direct contact between the human rights organization and the person who took and uploaded the video or image. Yet it is essential that they take precautions and not expose themselves to risk. Furthermore, the expertise that is required to verify open source data overwhelms most human rights organizations. A researcher needs to know ballistics, geology, pathology, and other related fields. That is not sustainable.

The ubiquity of the data means there will be more opportunities for triangulating evidence from different platforms: human, geospatial, and open source intelligence. Examples would include matching up perpetrator video uploaded onto social media, a human intelligence network, satellite imagery, and then getting defense ministries to identify specific units and even commanders.

Securing information is a big concern. Amnesty cannot rely on a social media platform, no matter how well intentioned, to secure video or other data. Amnesty is working with technologists to address this issue.

With respect to analysis, algorithms will save the day, but only to an extent. Social computation is also needed. This involves recruiting large numbers of volunteers over a digital network to analyze small portions of a larger data set, such as a satellite image. Examples of would include Decode Darfur, Amnesty's effort to monitor attacks on the Darfur region of the Sudan. Edwards distinguishes social computation from crowdsourcing, which for him involves the public – the crowd – to volunteer information over a digital platform. Asking for information is taken seriously by Amnesty and is regarded as an act one that can carry serious potential risks, as was noted above. Verifying information is always a challenge. Human Rights Investigations Lab at UC-Berkley is working with Amnesty to train students in open source research methods. University of Pretoria and the University of Essex are doing the same.

TANYA KARANASIOS, Deputy Program Director, WITNESS focused on the opportunities of video technologies to be used to push for change and defend human rights. The ubiquity of these technologies has helped to increase their impact. WITNESS was launched in 1991 after a citizen-shot video of police beating of Rodney King sparked a debate about racism, police brutality, and inequality in the U.S. The dream at the time for WITNESS was to get cameras into the hands of people, particularly activists who wanted to expose the truth. Today, that dream has become a reality.

> *As Ta-Nehisi Coates has said, "the violence isn't new, the cameras are new." The kind of abuse against black communities by police isn't new to those communities: it's just new for everyone else.*

But with those opportunities, Karansios acknowledged, there are still major challenges associated with the growing availability of these technologies and devices. There are issues around privacy, safety and consent. How can the "unseen actors", such as the tech companies and platforms where videos are uploaded, be better allies to human rights activists and citizen witnesses? WITNESS listens to and works with those who do this work on the ground and organize "trainings for trainers." The organization only trains those who it knows will be able and willing to share skills with others. A lot of WITNESS' work is to develop material, such as the "Video as Evidence" curriculum for Syria, which was driven by needs of activists on the ground.

TANYA KARASIOS FROM WITNESS.ORG

As Ta-Nehisi Coates has said, "the violence isn't new, the cameras are new." The kind of abuse against black communities by police isn't new to those communities: it's just new for everyone else, Karansios suggested. WITNESS uses this case study in trainings to caution against instincts to immediately post content online and rather to think how video can be used more strategically.

FRANCESCO SEBREGONDI, Research Fellow, Forensic Architecture, discussed human rights violations in "black sites." Sebregondi pointed out that the deluge of data can sometimes obfuscate and conceal as much as it reveals. With global platforms like Facebook and Twitter, the information that is not shared on social media starts to disappear from our consciousness. The public sphere and media landscape has shifted dramatically. When we think about using this technology, we need to think about how it can be instrumentalized and its agency preserved in the long-run. If it just creates engagement in the short-term without providing longer-term civil society engagement, one must ask if it is worth it.

Sebregondi described that architectural reconstruction has been used to rediscover traumatic experience and facilitate human rights investigations: his own organization has designed the experience of a solitary confinement cell, for example, which was shown up on the main screen to all symposium participants. Within the framework of 'hypermediatization' of the social and public life, human rights activists also need to use our knowledge and intelligence to produce engaging material: elements that can draw a user to experience testimonies that could not have been so powerful written down. Experiencing them through this more innovative medium deepens the impact.

To illustrate this idea, Sebregondi turned to the analysis of the Saydnaya prison in Syria (a joint investigation between Forensic Architecture and Amnesty International). In February 2017, Amnesty International released a report, "between estimates that between 5,000 and 13,000 people were extrajudicially executed at Saydnaya between September 2011 and December 2015" at the Saydnaya Military Prison, most by hanging. By interviewing survivors of torture in the prison, a detailed digital recreation of the prison and the torture practices that take place inside have been created.

DAY TWO

SUSHMA RAMAN, Executive Director of the Carr Center for Human Rights Policy, introduced the symposium's second day, reflecting on some of the key issues that participants had discussed the previous day.

These included the enormous scale and scope of issues and pace of change; the complexities of weaving together different data-points from different data sources at different points in time to create a coherent narrative about the past and to inform what happens in the future; and the complex array of challenges – ethical, operational, commercial and political in nature – that the proliferation of these new technologies now presents in the field of human rights.

LEGAL OPPORTUNITIES AND CHALLENGES OF THE USE OF TECHNOLOGY IN HUMAN RIGHTS INVESTIGATIONS

VICTOR WEEDN, Chair and Professor, Department of Forensic Sciences, George Washington University

Human rights and humanitarian law is grounded in natural law, whereas forensic science is found in man-made positive law (i.e. criminal codes). However, natural law is often codified and then translated into man-made laws (e.g. international human rights treaties and conventions) and both are prosecuted in courts of law. Forensic science is accepted globally as legitimate and important evidence for these courts. Although forensic science is "truth-seeking and speaks truth to power," access to it is unequal (a matter both of resources and will). Weedn described science as a tool that should be used fairly and equitably. Furthermore, issues arise regarding scientific evidence: when and who validates the science? What if the science is unknown, unsettled, or contested? Is a court the appropriate venue to answer scientific controversies? Moreover, settling scientific controversy requires time that is not available in the context of a legal court proceeding which must be resolved on the court docket schedule.

Laws relating to the admissibility of collecting evidence (e.g. 4th amendment search and seizure) are based on the idea of a reasonable expectation of privacy. Ubiquity of a technology calls this expectation into question. He discussed the implications for increasingly ubiquitous and accessible satellite imagery. No warrant is needed for something that could be seen by the public eye, but it is needed to look for digital evidence in a cell phone. In the digital age, does reasonable expectation of privacy exist anymore?

Weedn described the tension in human rights investigations between the right to privacy (individual rights, humanitarian law) and the right to know (societal rights, criminal justice law). There is also a question of ethical and moral responsibility where privacy is inconsistently enforced.

ALEXA KOENIG, Executive Director, [Human Rights Center, UC Berkeley] described the role of technology in human rights investigations.

The use of technology has changed our way of thinking about law: international humanitarian law is organized around the concept of holding states accountable to other states, such as in the conduct of war. International human rights law relates to the responsibility of states and state actors to individuals. International criminal law (the newest field, arising after World War II) relates to the responsibility of individuals to other individuals.

> *"Technology is neither good nor bad; nor is it neutral."- Melvin Kranzberg*

Koenig described the historical and contemporary technological advances that have helped transform dissemination of information. The printing press radically transformed the ability to convey information across distances. It could transfer ideas about what was acceptable in societies and what was not. The camera was another influential technological innovation; the International Committee of the Red Cross (ICRC) came about in part because of images of bodies on battlegrounds that moved people to address the effects of war. Similarly, smartphones are transforming the way we capture information and how that information can be used for accountability.

In the process of exhuming mass gravesites and understanding what has happened it can be important to bring in witnesses, but witness evidence is fragile (it can be discredited on the stand, as the process of testifying can trigger trauma). How can we strengthen these individuals? Investigators have the responsibility to find physical and documentary evidence to support the voices of witnesses who are coming forth, often at great risk to themselves and their families.

THERE ARE THREE CATEGORIES OF EVIDENCE FOR LEGAL ACCOUNTABILITY:

- TESTIMONIAL (WITNESSES),
- PHYSICAL EVIDENCE, AND
- DOCUMENTARY EVIDENCE (E.G. PHOTOGRAPHS, VIDEOS, TEXTS, EMAILS THAT LINK PARTICULAR CRIMES WITH HIGHEST LEVEL PERPETRATORS).

The International Criminal Court's mandate is to try the highest-level perpetrators for the most demanding crimes; to do this they need documentary evidence to draw these links. Perpetrators with legal responsibility are often not the same as those who have committed the crimes on the ground. The Berkeley Human Rights Center's "Beyond Reasonable Doubt" report found that compelling human rights cases were falling apart at early stages because courts were putting too much reliance on NGO reports and witness testimony without corroborating evidence (DNA, remote sensing, etc.).

THE QUESTIONS TO CONSIDER IN USING TECHNOLOGY EFFECTIVELY FOR HUMAN RIGHTS INVESTIGATIONS INCLUDE:

- *Is the technology affordable? Limited budgets of courts and investigators are often a barrier.*
- *Timing/Timeliness: How long does information take to collect? Different sectors working with the technology have different tempos, but ultimately need to align with the tempo of courts. Legal investigations can also only happen when there is political opportunity and can get on ground to collect evidence. Need to build capacity of those on the front lines (NGOs, first responders) to coordinate efforts to get necessary information since the ICC is slower-moving.*
- *We must consider the "Big Picture."*
- *Linkage: How does the technology we are using ultimately link the crime to the perpetrator at the top, rather than just prove the crime happened?*
- *Security: What new vulnerabilities does it create as we bring together data from different sectors? Are there risks associated with transmission of information?*
- *When can scientific evidence be considered standalone evidence in courts of law, and when it is it necessary to bring in expert testimony? (in US, Frye & Daubert test provides criteria/considerations, including: is this established science? Was the data gathered in accordance with established practices of the field? Etc.)*

THERESA HARRIS, Senior Program Associate, AAAS Scientific Responsibility, Human Rights and Law Program described the role of AAAS in training judges, courts, and commissions on the potential value of remote sensing and satellite images (geospatial technologies) as evidence in human rights cases. Trainees include the European Court of Human Rights, national human rights institutions in Asia, and the ICC. There is increased use of remote sensing technologies in human rights litigation, but very little case law addressing the admissibility of remote sensing data and images. The Rome Statute of the International Criminal Court: Article 64 and 69 provide ICC judges with broad discretion in what they can bring in as evidence.

Evidence before the ICC must have probative value for it to be admissible: "authenticity (has evidence been tampered with?) and reliability (what is the veracity of the information?)" are two indicators of probative value. Admissibility of the findings of the analysis is a different question: satellite imagery on its own may not present much evidence; one needs experts to interpret significance. ICC relies on expert witnesses to explain both probative value and to interpret satellite images and analysis. AAAS trains courts to understand accepted practices in the field of geospatial technologies so they can be smart "consumers" of this type of scientific evidence.

Remote sensing is helpful for corroborating information but often needs other kinds of evidence such as witness testimony ("ground-truthing"), to be useful in court. There have been cases where area/satellite imagery was not admitted as evidence because of conflicting interpretation by victim witnesses.

Privacy concerns will become more significant in use of satellite imagery in litigation as GIS technology improves and provides images with greater detail. This type of technology can also be useful in legal processes outside of international court procedures (e.g. individual cases, civil suits) and in investigative processes, helping investigators frame what type of information is needed to make a case, even when the geospatial data itself cannot be admitted as evidence in court.

> *Forensic science is supposed to be explanatory—if you can't explain the significance of the technology and data you are using for evidence in a case, it should not be in court.*

KEITH HIATT, Vice President, Human Rights Program, Benetech asked where accountability fits within the hierarchy of what victims of human rights abuses want. He argued that a trial can be extremely messy and can cause problems in transitional justice settings. Forensic science is supposed to be explanatory—if you cannot explain the significance of the technology and data you are using for evidence in a case, it should not be in court. This is a conundrum for digital forensics and open source investigations because they are still astounding to judges and jury at trial, seen as "wizardry," instead of accepted as common practice. This dynamic is particularly significant in open-source investigations (i.e. investigations that mine information sources that are publicly available, like Twitter, Facebook, and YouTube). Lawyers can no longer be ignorant of technology, which is increasingly relevant for human rights investigations.

THE PROMISE OF DNA SEQUENCING

DANIELE PODINI, Associate Professor in the Department of Forensic Sciences at the George Washington University

Daniele Podini discusses the promise of DNA Sequencing.

Podini provided a succinct overview of DNA, including is structure, function and how it is analyzed. Of the scientific and technical tools now used by human rights investigators, DNA sequencing is the most intellectually challenging for those outside the field. While remote sensing satellites involve, literally, rocket science, one of the key end products – pictures -- has an intuitive clarity. DNA sequencing offers no similar intuitive handle to the non-expert. It involves the investigation of things that cannot be seen (DNA) with the aid of complex instruments and processes that can be described only in a highly technical language.

Deoxyribonucleic acid (DNA) is the hereditary material found in almost all organisms, including humans. DNA is organized into long, highly structured strings of molecules (nucleic acids). More precisely, they are polynucleotides -- long chains of nucleotides. Most DNA is found in the cell nucleus (nuclear DNA), though a smaller amount is found in the mitochondria (mitochondrial DNA or mtDNA). DNA stores information as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). There are about 3 billion bases in human DNA. Of greatest interest to a consideration of DNA sequencing and human rights documentation is the transformation of this biological code into binary code using specialized microprocessors. How is this done?

Every person has two copies of each gene, one inherited from each parent. Although more than 99 percent of all genes are identical from one person to the next, a small number of genes (less than 1 percent of the total) vary among people. It is from these variations that the characteristics of individual human beings differ, including unique DNA signatures that allow for the identification of human remains.

The ability of DNA to store and transmit information is found in its structure as two polynucleotide strands that twist around each other to form a double-helix. Hydrogen bonds link the two strands, forming pairs. The strand has a sugar-phosphate backbone – the outer rail if one thinks of the double helix as a spiral staircase. The order of the bases along a single strand constitutes the genetic code. This is the basic morphology of DNA.

DNA replication involves the use of the enzyme helicase that breaks the hydrogen bonds holding the two strands together. Both strands can then act as templates to produce the opposite strand. This is DNA sequencing. The most important technological development has been the discovery of Polymerase Chain Reaction (PCR). PCR is a method developed by Kary Mullis in the 1980s and is based on the ability of DNA polymerase to synthesize new strand of DNA that are complementary to an offered template strand. Because DNA polymerase can add a nucleotide only to a specific preexisting group, it needs a primer to which it can add the first nucleotide. This requirement makes it possible to delineate a specific region of template sequence that the researcher wants to amplify. PCR is rather like a photocopier that makes copies of specified regions of the genome. The copies are made exponentially, meaning that in short order billions of copies are made. These are called short tandem Repeats (STRs), though they are also sometimes referred to as micro-satellites or simple sequence repeats (SSRs).

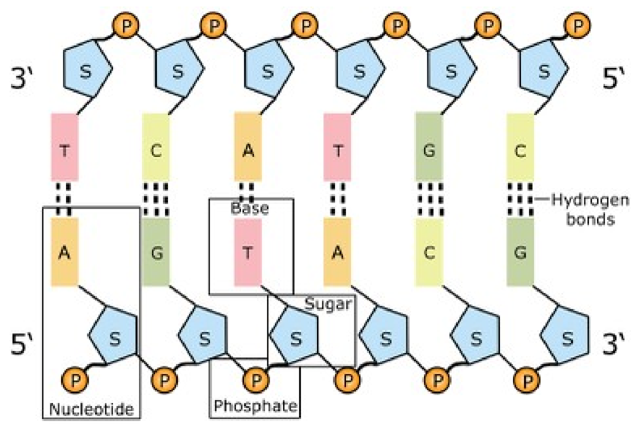


Image adapted from: National Human Genome Research Institute.

There are several basic steps common to all massively parallel sequencing approaches. The first step is the generation of an in vitro library from the sample. Sequencing efficiency is determined by the quality of the library. After a library is constructed, the DNA molecules within the library are amplified to generate additional copies. Some NGS processes use fluorescent dyes in a way that is like the older Sanger method. NGS is now also done in channels, chambers, nanowells, or on assembled nanoballs, depending on the manufacturer of the instrument. In one approach, the library is captured in a channel and then amplified to generate a small cluster from each captured molecule. The processes that follow are called runs. Runs from multiple channels can generate about 600 gigabases (Gb) of sequence in an 11-day period. With Massively Parallel DNA Sequencing investigators can analyze hundreds and even thousands of regions at the same time, all at a much lower cost. Comparing sequences of samples taken from a bone or tooth fragment with a reference DNA sample taken from a living relative or any familial reference sample offers evidence as to their relationship. Probability statements concerning the likelihood of a random match between DNA samples taken from different persons can reach one in several billions probability. It could be that the probability of randomly selecting an individual in the population with the same STR profile as obtained from the evidence and the reference sample is as great as one in one hundred billion.

STEFAN SCHMITT, Director of the International Forensic Program, Physicians for Human Rights

Schmitt began by emphasizing that his approach is from a transitional justice perspective, not a genetics perspective. He focused on the attributes of a positive Identification in non-conflict and non-mass fatality events. It involves a legal authority declaring that the deceased had this identity according to extant records. Therefore, DNA is not the normal way of going about making an identification. Most people who die outside of a conflict zone enjoy a civil identity established by records kept by a consolidated state. Civil identity usually comes with obligations of the state to determine the cause of death. Death by natural causes results in another artifact of civil identity: a certificate of death. If there is suspicion that the death was not the result of natural causes, the state is then obliged to investigate the cause of death. In the United States, it is the medical examiner who rules on the cause of death. In mass fatality events or deaths by unnatural events DNA analysis becomes important. DNA is a game-changer in this respect. Even in mass fatality events, body/landmark comparisons are no longer needed, meaning that any part of the body can be used to establish the identity of a deceased individual. DNA analysis doesn't event require a match with a living relative if, instead, one has an article – such as a toothbrush – that is known to have been used by the deceased. Next of kin analysis is also of obvious importance. The sample doesn't have to be big; it can be microscopic. A small piece of tissue will be enough to get DNA.

> *Science, never and cannot act in a vacuum. It must be applied within a specific political and social context and its limits must be clearly enumerated.*

Before DNA technology, investigators had to rely on antemortem data collection (a story about how the person disappeared, photos, dental records, X-rays) and on comparisons of where a skeleton was found and its place in a physical space. These things are still important but now care must be taken to align antemortem data with DNA laboratory work. Field work must be integrated into the laboratory-based analysis of DNA. Properly identifying the remains as it goes to the laboratory, for example, is important. DNA information is, basically, a set of numbers. One's individual genetic profile is expressed as a series of numbers that really is not all that sensitive to privacy concerns, in Schmitt's' view. What is sensitive are the relational information, family genetic connections. "Where this gains importance is in the relationship analysis. It establishes biological relationships. Examples of sensitive information would include knowledge that 'You are your mother's son but not your presumed father's'. In some places -- such as Afghanistan -- that can certainly lead to adultery charges or honor killings."

THOMAS PARSONS, Director of Science and Technology, International Commission for Missing Persons.

A primary motivation for going to DNA identification methods is that it's a homogenous process that lessens the need for an intensive investigation-driven approach spanning many disciplines, and can be applied uniformly to many kinds of missing person scenarios, such as disaster victim identification, terrorism, victims of war crimes, and transportation accidents. It has many different applications. DNA analysis constitutes a cost-effective solution to these various problems. That said, DNA analysis never works in a vacuum; it is always a part of a larger process. To identify people, we must first find out where they are, where the bodies are located. Here one can use remote imagery. Expertise in crime scene management is needed to recover the bodies. Extraction and analysis of DNA must fit into pathology, anthropology, and systems for antemortem data collection. There must also be a system for the protection of sensitive data. All of this must fit in a rule-of-law framework. One must have very high standards of reliability. DNA analysis must fit into the various processes that handle a wide variety of events, from terrorist incidents to conventional crime scenes to human rights investigations. An NGO doing this sort of work should operate in a rule-of-law framework. The biggest obstacle to using DNA analysis is not technical: the biggest challenge is to map DNA analysis into the many roles and responsibilities of the many players that are involved in this

process in a rule-of-law framework. That might be medical and legal authorities, and law enforcement. “This is what sometimes prevents us from identifying people.”

What is the potential for next-generation sequencing (NGS), also known as massively parallel sequencing (MPS)? The cost of sequencing a single base of DNA has dropped at a rate that outpaces Moore’s Law. Moore's law refers to Intel co-founder Gordon Moore observation in 1965 that the number of transistors per square inch on integrated circuits doubled every 18 months.

In the last ten years, the cost of sequencing a single base of DNA has decreased by a factor of at least 100,000. That is raw sequence analysis. “The cost of doing the sort of DNA tests that have been described here have changed hardly at all. We’re a lot better at it, we’ve narrowed it down, but we are not talking about orders of magnitude.” Still, adapting cost effective NGS methods to missing person identification offers great promise.

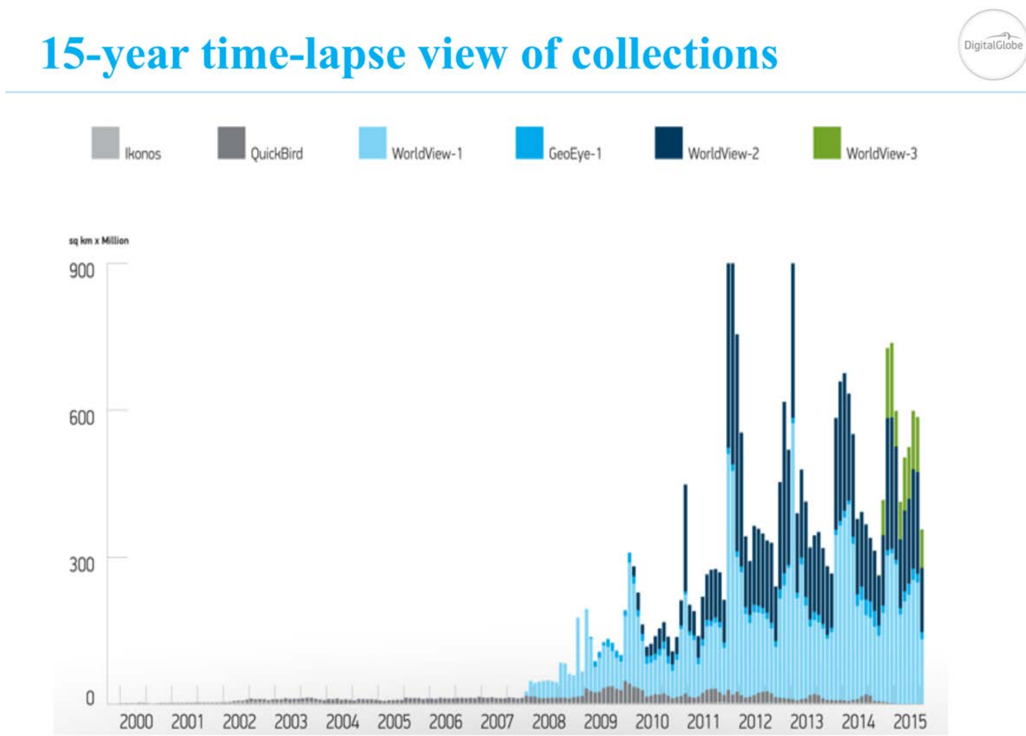
DNA degradation presents a problem that sometimes goes unappreciated. It is sometimes quite hard getting DNA out of highly degraded remains. One of the bigger technological achievements is the ability to do that. PCR inhibition is a problem. “PCR inhibitors are any factor which prevent the amplification of nucleic acids through the polymerase chain reaction (PCR). PCR inhibition is the most common cause of amplification failure when sufficient copies of DNA are present.” Furthermore, kinship analysis requires that a comparatively large amount of genetic data is obtained. When multiple first degree relatives are available, identification is usually assured. While other combinations of reference individuals can provide for DNA identification, availability of enough close relatives is often a limiting factor. ICMP’s database usually has three or four family members per missing person before it is considered complete. With massive refugee displacement, relatives are now often scattered about the globe. This calls for analysis with fewer family members as genetic references. ICMP is developing novel NGS approaches that target greater amounts of genetic information, to allow identifications to be made with fewer and/or more distant relatives.

Data storage is another issue. Just a single run of a modern NGS instrument produces four or five gigabytes of data. These technologies need to get a lot cheaper. There is also a great need to automate these processes. There are also ethical issues. When a family member steps forward to provide a reference sample they might be putting themselves at risk. Also, any DNA identification effort involving kinship analysis is likely to encounter instances of non-paternity. This raises the need for appropriately formulated and enforced data protection mechanisms generally, including in local contexts with domestic authorities. How are data protected? Can ICMP empower local authorities to do DNA kinship analysis in the absence of reliable privacy protection mechanisms? Quite often the answer is no. There is a capacity question, too. Can the capacity to do this sort of work be created in country: at the location of the need? Given that this is complex, sophisticated testing with a high requirement for documented rigor, the answer sometimes is that they cannot, at least on a time frame most relevant to the need. It is not uncommon for a group to be trained and then soon replaced by others who lack the training. While development of local/domestic capacity is a laudable goal, and pursuing it should be norm, often the best approach is to complement local testing capacity at the outset, to put in place an identification system that can rely on robust DNA results without the need for a multi-year development process to be completed. With an effective scientific identification system in place, domestic laboratories can then develop their capabilities to an appropriate level of rigor and be increasingly engaged in the process as they able and ready. Then, again, there are costs. Parsons showed a picture of a single mass grave in Haiti, containing the bodies of up to 10,000 persons killed in the 2010 earthquake, with no provision of any kind made for their identification. In contrast, after the 9/11 terrorist attacks in New York, where vast quantities of money were spent in an attempt to identify as many victims as possible. The costs and scale of need are enormously disproportional, and it should be a goal of both policy and technology development to expand access globally to effective DNA identification capabilities.

DATA AND THE COURT OF PUBLIC OPINION

RHIANNAN PRICE, Senior Manager of the [Global Development Program at DigitalGlobe]

Price introduced her talk by noting the sheer volume of data that DG has collected. Each of DG's satellites orbits the Earth around 16 times per day and collects over 3,000,000 square kilometers (1,158,306 square miles). The DG library of images collected over the last 15 years contains nearly 90 petabytes of data. How big is a petabyte? If the average smartphone camera photo is 3 MB in size and the average printed photo is 8.5 inches wide, then the assembled petabyte of photos placed side by side would be over 48,000 miles long. DG's satellites, because they are higher-resolution, they produce much more data than its current competitors.



15-YEAR TIME-LAPSE VIEW OF DIGITALGLOBE'S COLLECTIONS
COURTESY OF DIGITALGLOBE

What does DG do with all the data? It has invested in its geospatial big data platform (GBDX). Once collected, the imagery is processed (such as orthorectification, atmospheric compensation (AComp), a DG proprietary processes that corrects out some of the haze that is sometimes found in satellite images. Processing also sometimes involves color balancing. DG also leverages open data to enhance its imagery. By using an inverted pyramid representing what she called the "information food chain" of users, Price presented different levels of engagement and the kinds of geospatial products they might use:

- Developers: at the tip of the pyramid, develops new data processing and production techniques who might us DG's Maps API.
- Remote sensing GIS users, such as people who use ArcGIS and other packages to analyze their own tabular data
- Business users: companies purchase cloud based applications to help them run algorithms that are already produced for them. They use other people's data and other people's technology to answer their own questions. DigitalGlobe calls this the Answer Factory. It streamlines image processing. It is a cloud-based platform that the client logs onto. This allows the client to avoid the challenges associated with managing big data.

CHRISTOPHER MCNABOE, Manager of the Syria Mapping Project at the Carter Center

McNaboe began the Carter Center project by simply using Google searches to find information about Syrian defectors. He was searching with the word "defectors" in Arabic. He came to realize that the results were related to the Syrian opposition and not to government defectors. YouTube accounts, Twitter accounts, and other platforms contained information about the opposition, but not the government. He never found people defecting from the opposition to the government. Divisions in society such as these are perpetuated by the digital platforms that were once thought to be bringing us together. This also brings up questions about the nature of justice pursued after a conflict. Will families demand retributive justice now because they have the YouTube video that shows what happened to a loved one? The data are out there. But the concern is that the data that are available are not representative of what happened. This goes back to the point about the lack of digital content from government defectors. Also, different groups use different platforms. IS seems to prefer Pasteit. Pro-government forces sometimes tend to post videos to LiveLeak. The opposition tends to use YouTube. Twitter is also popular. Initially, he plotted about a year and a half of geolocated tweets (only about 1% of the total) on a map. What he got was a map of government-controlled areas. There was not a single geolocated tweet from the opposition. Nonetheless, he still often sees news reports covering what we can learn from Twitter about the Syrian conflict. They seem not to understand how biased these platforms can be.

There are other questions about data. Who has access to the information, and who has the capability to analyze it? Palantir, the data analytics company, was brought up in the first day in connection to concerns about its connection to the U.S. intelligence agencies and the Pentagon. Groups that are monitoring abuses of the Syrian government have access to tools like Palantir. Yet export control requirements mean that a pro-Syrian government effort at monitoring abuses by the opposition means that it will not have access to tools like Palantir. To manage the sort of data now available means tools like Palantir are needed. So here is another source of bias. Digital technologies and data analytics are not in the traditional core capacities of NGOs. When they do try to use technology, it is often duplicative of work that has already been done by others. Rather than ramping up internal capacity an alternative is to partner with organizations that already have it. The Carter Center had no capacity to do the sort of data mining and analysis called for in its Syria monitoring initiative. Palantir has been great for the Carter Center, though there have been grumblings about the partnership, often coming from colleges in the Boston area. In general, he sees a trend toward the democratization of data and data analytic tools themselves. One example of this is Wikimapia.

HEND ALHINNAWI and **TAHA KASS-HOUT**, Co-founders, Syria Tracker

Alhinnawi and Kass-Hout noted that, at times, innovation is not merely about the "next best thing." Instead, it is about taking an existing technology and applying it to a new situation or conflict. This is the case with Syria Tracker: it leverages tools previously used and refined in epidemiology.

Syria Tracker has already highlighted the potential impact of these tools and technologies. For example, Save the Children claimed its 2014 polio vaccination campaign in northern Syria vaccinated everyone. Syria tracker analyzed the data and found that approximately 23,000 children were not given the vaccine. Most of these children were in areas controlled by the Assad government. Syria Tracker's analysis led Save the Children to return to the region and vaccinate all those that they had missed the first time around. This would almost certainly never have happened had the data not been open and publicly available. Transparency made this possible. This story highlights the critical link between human rights, accountability, optics and data sharing. Syria Tracker cannot tell you how many people have died, KASS-HOUT explained, but it can help uncover trends and insights that can inform policy. Discussing his book Biosurveillance: Methods and Case Studies, Kass-Hout said that insights from disease tracking relate directly to the work of big data and human rights. This realization, combined with his personal experience working for Google.org, was instrumental in leading him to invent and launch Syria Tracker.

THE FUTURE OF HUMAN RIGHTS

KATE DOYLE, Senior Analyst of U.S. Policy in Latin America at the National Security Archive.

Doyle is the director of the Evidence Project at the National Security Archive (NSA), a nonprofit organization affiliated with George Washington University in Washington, DC. The NSA uses

Freedom of Information Act requests to reconstruct the historical record around U.S. foreign policy and national security issues. Because U.S. archives tend to be more open and accessible than the archives of Latin America, and because of U.S. longstanding support for the region's militaries, U.S. archives sometimes constitute a sole source of information about Latin America's Cold War history of political repression and state terror. The discovery in Guatemala of the National Police Archives was an important exception to the rule. She and other human rights investigators can triangulate U.S. declassified documents, newly emerged Guatemalan National Police records, and the forensic work carried out by the Guatemalan Forensic Anthropology Foundation. Doyle perceives a broad shift in the human rights work she does in Latin America, one that places more emphasis on the forensics paradigm, where an abuse is considered a crime as well as a violation of human rights. Here she is highlighting the classic notion of forensic as having to do with court investigations and prosecutions. With that as a premise, she went on to flag some of the challenges it presents.

We all have great expectations for the technologies that have been highlighted at the conference. But she pointed out that it can take a long time for these technologies to filter into the field. It is also important to protect the analog (such as hand written notes), as Stefan Schmitt noted elsewhere. Digitized records require constant upkeep because of formatting changes. Technology might also change an investigator's relationship to victims. There is the possibility that family members, for example, will not accept DNA evidence. There is also the need to train human rights advocates and court workers in these new technologies. This is something that both AAAS and the Berkley Human Rights Center do.   Finally, Doyle, mentioned Kathryn Sikkink's point about the deliberate suppression of information, noting that she would add the deliberate manipulation of information. The NSA finds this all the time, including instances of fabricated documents. These are all issues that should be flagged.

ALEXA KOENIG, Executive Director of the Human Rights Center at UC Berkeley School of Law.

In Koenig's view, there are three challenges to technology and fact finding: First, there is the issue of volume with a deluge of data. Second, there is the issue of access to the information about what is happening on the ground. Third, whose voices are getting heard in the context of race and gender. Considering these three issues, over the course of the conference there were lots of insights and examples concerning the access and volume issues. But the greatest challenge is with the integration of human and technological capabilities. There were some examples given that were promising. For example, social computation and crowd sourcing are examples of how we can combine the human with the technological. But there are ways we are obscuring evidence. What kinds of gender biases are built into our technologies? Algorithms that have been found to produced racially biased results offer an example. We must also remain aware of the possibility that low-tech solutions to problems are available and, perhaps, most appropriate. Some solutions are found in simple, non-technical responses. Koenig ended by suggesting that there needs to be a conversation between the privacy community, investigative teams, and security considerations. We need to know what are the balancing considerations from all three perspectives.

KEVIN O'CONNELL, President and CEO of Innovative Analytics & Training

O'Connell began by noting that his background experience in government service set him apart from many of the other conference participants. His talk focused on analytical trade craft – what sets good and bad intelligence analysis apart. A part of his consideration is the potential for cross-linking various technologies. He noted that the science of remote sensing is now well-established after about 70 years of use. Yet the value-added data analysis side of things is moving very rapidly. New kinds of data – multispectral, radar, change detection capabilities – calls for attention to analytical trade-craft. Data from different platforms calls for specific skills that might not be as developed, as one would hope. We must pay attention to the human aspects of analysis, not just the technical. Human are still better at some things, and we need to train them to do those things.

He also offered a perspective from government. Many technologies that have emerged in the civilian sector, such as commercial remote sensing, have done so because governments have wanted it to happen. Commercial remote sensing offers an example. Yet it is by no means evident that the liberalization of technologies – their continued privatization -- will continue, and we shouldn't assume that it will continue. With remote sensing, for example, governments are starting to get nervous about the amount of data that are now in the open. Finally, we need to look at who will use the data. Human rights groups do. Other well-intentioned groups will, too, but poorly because of incompetence. Finally, we must ask how others with less noble intensions use the data. We can take pride in how human rights groups use them, but what about others with less noble intentions? There are malicious actors out there, too. Then there are questions about anticipatory analysis: if I can model a problem today one can use advanced computational power to map out possibilities. With that we can make better decisions. It is not prediction, but it's a path that helps us think about future problems we must address. Finally, solutions to today's problems require a multi-disciplinary approach. The conference succeeded in bringing in a diverse group of experts to compare notes on common problems.

ALIX DUNN, Executive Director and Co-Founder, [The Engine Room].

The Engine Room works with groups in the social sector who lack technical capabilities but believe that technology might in some way benefit their work. The Engine Room is a technical consultancy for such groups. In those conversations, intense power dynamics come out. She offered two points about power and two points about sustainability. She began with power. The conversation at the conference has been about forming collaborative teams. Yet the people at the conference come from academic settings and are often white and male. She claims that this sometimes leads to a disconnection from the problems that need to be solved. And because of that dynamic we must think about how problems are selected and who is selected to be in rooms where issues are discussed. Secondly, decentralizing the creative process is also important to consider. Opening the creative process to groups and people working on the front lines is needed. It is their lived experience that we are trying to change, trying to improve.

Regarding sustainability, the balance between experimentation and infrastructure is important. There hasn't been a conversation about how we are in a zero-sum game where we need to allocate resources efficiently. This is a technological and political conversation. We can identify problems with reusability components that we can scale.

Also, value capture is a potential problem when working with private companies and corporations. When we in the human rights community innovate, it generates insights and technologies that companies can capitalize on. That does not translate into more resources for the innovators in the human rights community to keep going. The companies they monetize, on the other hand, have more resources and a greater impact.

What are important next steps? Being reflective on collaboration is important, and we should talk about who is making decisions, who has the money, who gets in the room. Let's diversify this space.

SCOTT EDWARDS, Senior Advisor at [Amnesty International's Research Directorate]

Edwards outlined ten prognostications, as he called them.

1. The Internet and the telecoms will continue to fracture because of commercial activity, but also because of human behavior. As people and technologies continue to cluster (on Facebook

for example) it will present a challenge. Non-discriminatory access to information might become a problem.

2. Machines will have an overwhelming influence on narratives. As bots get smarter, it creates greater challenges to those trying to capture narratives. “Twitter is a wasteland of machines.” These machines influence human behavior in way that can be damaging.

3. An emerging benefit is persistent monitoring with sensors that are getting better. That will benefit certain types of investigations, though it might also benefit certain kinds of repression.

4. Data acquisition will approach a limit of $0, though the costs will come from service provision and value-added processes.

5. The limitations places on interconnectivity in repressive places will only get worse. Ultimately, new international legal instruments will be needed regarding access to information and new international watchdog agencies to monitor those rights.

6. Virtual reality will be everywhere. “We won’t have PDFs in communicating human rights challenges and the prosecution cases in tribunals VR will be the method of interaction.”

7. Activism is going to change. Human cognition and quick ability to make decisions and assessments will save us from data overloads. Channeling people in the right way to the right infrastructure with the right safeguards in place with the right shared experiences represented are going to be very important to make sure we are getting unbiased data.”

8. Local civil society organizations (CSOs) will drive human rights successes in the 21st century. They are going to be more capable than ever, but also under greater threat than ever.

9. The full force of network analysis, familial mapping, data science leveraged by repressive states will be a challenge. Human rights organizations are going to be driven into a tactical, rather than mere advocacy role in interventions, filling in for almost some sort of counterintelligence roles in assisting local CSOs.

10. Human rights organizations can all collaborate on forecasting and early warning. A benefit of big data is that we can use machines to help us make sense of data. We now have the capability to map and forecast – though not always with the greatest degree of spatial/geographical precision or with sufficient lead-time – we can begin to predict human rights violations.

JOSH LYONS, Satellite Imagery Analyst, Human Rights Watch

Traditional human rights actors are experienced and skilled in handling sensitive data in the framework of established policies and procedures. The centrality of protecting witnesses, or protecting data, of doing no harm is at the center of all investigative processes. The challenge with new technology is the introduction of new communities from different technical environments. Through no fault of their own, they simply are not aware of the tradition and history of human rights and of the necessity to subordinate research to the overall paramount concerns of supporting people and respecting their human rights (dignity, life, privacy). There are now tensions in this new environment. In these new volunteer communities and these new actors are releasing data and are driven by ideological values about sharing and openness that are antithetical to protection and privacy values. New technologies are providing traditional organizations with new types of data, which were previously unavailable to them. How do we make new information actionable, without making ourselves part of the problem? For example, Human Rights Watch found itself in possession of satellite imagery showing the bunker where a wanted war criminal was in hiding. This presented a problem, one that HRW had no experience with until then. To whom does HRW give this information without itself becoming a party to the conflict? What if civilians are killed as authorities try to arrest him? Would HRW be responsible for those deaths? Traditional organizations are faced with these new situations.

What about disinformation, propaganda and spoofing? The data deluge is increasing the amount of deliberate disinformation. People are accidently creating uncertainty in the process of trying to triage and evaluate new material. The potential for miscommunication and distraction is there. Technology driven mistakes also occur. Data mistakes are easily made and easily caught, if they are recognized as having occurred. Mistakes made by international organizations and NGOs can be very harmful.

CONCLUDING REMARKS

KATHRYN SIKKINK: Closing Remarks

Sikkink began by recalling a passage from her book, Activists Beyond Borders:

> AT THE CORE OF NETWORK ACTIVITY IS THE PRODUCTION, EXCHANGE, AND STRATEGIC USE OF INFORMATION. THIS ABILITY MAY SEEM INCONSEQUENTIAL IN THE FACE OF THE ECONOMIC, POLITICAL, OR MILITARY MIGHT OF OTHER GLOBAL ACTORS. BUT BY OVERCOMING THE DELIBERATE SUPPRESSION OF INFORMATION THAT SUSTAINS MANY ABUSES OF POWER, NETWORKS CAN HELP REFRAME INTERNATIONAL AND DOMESTIC DEBATES, CHANGING THEIR TERMS, THEIR SITES, AND THE CONFIGURATION OF PARTICIPANTS.

(Keck and Sikkink, Kindle Locations 76-79).

Steven Livingston had called attention to the passage in his opening remarks the day before. The exchange of information served as the leitmotif of the entire conference. Satellite technology, network data mining and social computation, and forensic science, including massively parallel DNA sequencing are involved in overcoming the deliberate suppression of information. Sikkink noted that in 1998 when the book was written, the information environment was very different. What is more, much of the book was about groups in Latin America in the 1970s. The groups she was working with did not have computers, much less the Internet. "In that relatively poor information environment the assumption was that the information politics of transnational movements was absolutely necessary. We knew so little about human rights violations around the world." The sort of questions that came up during the conference -- such as "Should we make what we know public?" or "When should we make it public?" -- were not relevant in the 1970s. "There was a desperate need to get the information that was available out to the public as quickly as possible."

Today, as the conference has made clear, there is an order of magnitude increase in the richness of information. It's information politics on steroids. In this situation, new issues emerge. Francesco Sebregondi's amazing presentation about torture in the Saydnaya prison in Syria (a joint investigation between Amnesty International and Forensic Architecture) describes a much more compelling version of the same kinds of stories that were being told by survivors of the Argentine concentration camps in the 1970s who would draw crude outlines of the camps on paper. The advances in information technology have made amazing contributions to human rights around the world.

We are now aware of a debate in the world of forensic science between those who believe that most of the burden must be carried by international groups who have the expertise and institutional capacity to maintain control over sensitive data and those who believe that local capacity is essential and a way to overcome the lingering sense of outside intervention into local affairs. Sikkink expressed that both international and local capacities are essential for realizing prosecutions. And as Thomas Parsons noted, it is a false dichotomy. She also noted that perhaps too much thought is being given to providing information to international tribunals when in fact it is the domestic tribunals that have made the greatest headway in seeking justice for human rights abuse prosecutions. This was a finding of her research reported in her 2011 book, The Justice Cascade.

But what about the potential ill-effects of information technology and information deluge? Sikkink noted that she is writing a book about the new pessimism about human rights. There is tremendous pessimism about ill-legitimacy and ineffectiveness of human rights law, institutions and movements. How could this be possible? From where does this pessimism come? "One part of the answer is that we know so much more than we ever knew before about human rights violations, and we care so much more, that we think the world is a worse place." She went on to say, "That this dramatic increase in information may have contributed to an increase in pessimism." Elsewhere, with Ann Marie Clark, Sikkink has referred to this as the information paradox (Clark and Sikkink, 2013). In public health research, there is something called surveillance bias: The closer one looks, the more likely one is to find evidence that something is wrong. That might be part of the explanation behind the apparent worsening of human rights around the world. Public health researchers are finding methodological means to correct for surveillance bias. Sikkink suggested that human rights investigators learn from public health researchers on how to manage for surveillance bias.

There are also lessons to be learned from the earlier networked advocacy research literature. It found that networks are built around trust and face-to-face contact. So paradoxically, even in this digital world, trust and face-to-face contact among members of a community of practice is still important to human rights work. People can move in and out of networks by choice, and they often do. It is difficult to form generalized networks. Rather, they tend to be formed around particular campaigns and specific goals. There needs to be cases that can be shared.

STEVEN LIVINGSTON Closing Assessment

Two principal ideas shaped the organization and execution of the Carr Center Conference on Technology and Human Rights: The first was Kathryn Sikkink's observation that those who abuse the rights of others often attempt to hide their actions from outside observers. Human rights investigators must, as she and Margaret Keck put it, overcome "the deliberate suppression of information that sustains many abuses of power" (Keck and Sikkink, Kindle Locations 77-78). Information about abuse is sometimes obscured by environmental factors, such as distance and remoteness. In other cases, investigations by fact-finding teams are too dangerous. In other cases, events unfold too rapidly to be reported by conventional means. And even if direct access by outside investigators can be realized, the perpetrators often destroy evidence: documents are destroyed and bodies obliterated. How do the technologies discussed at the conference address those conditions?

Geospatial, forensic and digital network sciences and technologies help overcome inaccessibility of information. A growing number of satellites observe events on the ground with powerful sensors. At the same time, local inhabitants, armed with mobile phones and cameras, record events and their aftermath and share information over digital networks (sometimes intentional and sometimes not) with distant investigators. Perpetrators even post boastful accounts of their deeds on social media. In some cases, forensic scientists exhume graves, collect antemortem evidence, take DNA samples from living relatives and from the remains of the dead. In short, inaccessibility and suppression of information is today challenged by digital technologies. Even when fact-finding missions are undertaken, these technologies gather information that corroborate evidence obtained by interviewing witnesses and survivors and gathering documentary evidence. Using digital technology, human rights organizations undermine the deliberate suppression of information.

As promising as this sounds, some conference attendees expressed cautions and concerns.

Although technologies as distinct as remote sensing satellites and DNA sequencing machine can complement and strength human rights investigations, they do not do so seamlessly and without tension. Professionals using different technological platforms approach investigations quite differently. To put the idea in scholarly terms, geospatial, network, and forensic technologies create highly complementary affordances (Livingston, 2016). An affordance is a feature of a technology that invites a range of potential uses by its very design. Geospatial affordances invite observation of distant events; network affordances invite decentralized collaborative work on a common goal or problem; and forensic affordances invite the digitization of physical material – such as a bone fragment – that reestablishes identity. As seamless as all of this is conceptually, in practice technologies come with professional communities of practice. A community of practice consists of people with common professional training, sometimes common mentors (such as Clyde Snow and Eric Stover), professional and ethical standards, associations, personal networks and shared experiences, and standard procedures. Collaboration among the technological affordances is mediated by respective communities of practice. Rather than a seamless blending of technological potentials, collaborations might look more like large weddings with culturally distinct families awkwardly working out new relationships and family dynamics. It does not always go according to plan.

There were also deeper concerns expressed by some participants. One participant pointed to what might be thought of as a culture-clash between some working in the new generation of human rights technologists and traditional human rights practices and principles. Some technologists lack appreciation for the tried and true principles of traditional human rights investigations, principles that take great care with handling information that might put lives at risk if handled inappropriately. For some technologists, openness and transparency is an ideological commitment. It is, too, for human rights groups, though it must be tempered by an awareness of the broader effects of transparency. Some noted, for example, that DNA sequencing produces extremely sensitive information. For example, it is not uncommon for investigators to discover evidence at odds with assumed parental lineages. In some countries, such information carries potentially dire consequences. Likewise, as sensors on satellites and, especially, civilian drones become more powerful, care must be taken with georectified images.

Secondly, as costs diminish and availability grows, the potential for misinterpreting satellite images grows, as does the creation of disinformation. Groups without the in-house technical capacity or the budget to outsource it to professionals might misinterpret images, and in the process cloud awareness more than clarify it. This can be dangerous.

As satellite revisit frequencies improve, approaching persistent surveillance in some locations, human rights organizations will be tempted to become, as one conferee put it, a counterintelligence arm of the abused and oppressed party to a conflict. But can an NGO become an operational element in a conflict? At one point in 2012, HHI's Satellite Sentinel Project realized that it could not use its awareness of a pending attack on a South Sudanese community by Sudanese forces because it could not justify the possibility of "getting it wrong." If HHI were to tell the threatened population to flee, it might very well-result in it heading straight into the attack. Yet doing nothing would also have consequences. Although NGOs now sometimes have operational capacities in conflict zones, they lack an ethical framework that would permit the role that modern technology invites.

Third, mobile telephony has allowed those directly caught up in a conflict and subject to war crimes and human rights abuses to reach out to the outside world. Tweets, text messages, Facebook and other social media posts offer a running record of events, even when journalists and human rights investigators are barred. But can human rights organizations ask locals to investigate abuses, especially those who lack the training that usually precedes the role? If a human rights organization asks for a photo or video of an event or an area (such as the location of a mass grave), and the content includes metadata that ties it with the person who collects and sends it, is the organization responsible for that person's well-being when authorities arrest him or her because the data transfer was intercepted?

A fourth concern expressed by the participants involved NGO alliances with information technology corporations. Few NGOs have the technical capacity to manage and analyze big data. The Carter Center's Syria event mapping initiative for example, partners with Palintir, a data analytics company, to analyze the data used to populate the map. Palintir received its startup funding from In-Q-Tel, the CIA's startup funding arm, and from Peter Theil, the controversial Silicon Valley billionaire. Besides the Carter Center, Palintir has worked with several U.S. government groups, including the CIA, DHS, NSA, FBI, the Marine Corps, the Air Force, Special Operations Command, and West Point. In another example, DigitalGlobe, the commercial satellite remote sensing company, recently acquired the Radiant Group, a company with close ties to the intelligence community, including the National Reconnaissance Office. As human rights organizations turn to technology they also venture into terrain dominated by corporations that are adjuncts of the intelligence and defense community.

Finally, Kathryn Sikkink wondered if some of today's common pessimism about human rights is the result of measurement biases created by more powerful and available technology. If one thinks of information technology as a net pulled through human experience, what was once a broad-gauge net is now fine. Fewer events pass through without capture. This leaves open the possibility that the number of events over time have remained stable, or perhaps even diminished, yet the higher-gauge – the more powerful and available technologies – captures more of them, leaving the impression that abuses are more common. Secondly, four decades of human rights work has created a global awareness and sensitivity to abuses that would have been taken-for-granted in an earlier era. Awareness and technical capacity combine to create false impressions.

The use of digital technologies by human rights groups has emerged as an essential focus of ongoing scholarly attention. The Carr Center for Human Rights Policy conference made a significant contribution to furthering our understanding of their use.

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