Science and Human Rights: A Bridge Towards Benefiting Humanity

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ABSTRACT

Three case studies involving scientists from different disciplines that contribute their expertise to advancing human rights in the US and abroad are discussed. Scientific research can have a greater impact on society if directed towards solving problems relevant to human rights. Progress in science and technology can be abused, leading to violations of human rights, but can also benefit humanity. Scientists have an opportunity to play an active role in preserving human rights.

I. INTRODUCTION

I am a survivor of a concentration camp. My eyes saw what no person should witness. Gas chambers built by learned engineers. Children poisoned by educated physicians. Infants killed by trained nurses. Women and babies shot and burned by high school and college graduates. So I am suspicious of education. My request is: help your students become more human. Your efforts must never produce learned monsters, skilled psychopaths, or educated Eichmanns. Reading, writing, and arithmetic are important only if they serve to make our children more human.¹

Educator Haim Ginott powerfully illustrates how science can be abused to perpetrate atrocities such as genocide. The time has long passed since scientists have been able to claim that in order to maintain their objectivity, they need not be concerned with the social or human impact of their studies. The horrendous results of research, such as the Tuskegee Syphilis Study and the experiments on concentration camp victims performed by Dr. Joseph Mengele, have led to the enactment of US and international laws that mandate the ethical treatment of participants in research.² Because science has been used in such morally repugnant ways, scientists bear a special responsibility—not just to avoid harming people in the future—but to engage in research that provides positive benefits to the human condition.

Scientists can contribute to human rights in many ways.³ In what has arguably become a classic in the subject of science and human rights, Richard Pierre Claude's Science in the Service of Human Rights, Claude describes how the Universal Declaration of Human Rights and the subsequent International Covenant on Economic, Social and Cultural Rights evolved as a reaction to the atrocities mentioned above.⁴ Claude illustrates

how scientific progress can create new human rights issues in biomedical ethics and information technology, as well as how scientists have solved certain human rights problems. In a review of Claude’s book in the *American Scientist*, Susan Lederer concluded, “[It] helps us to understand how far we have come since the bleak days of the Second World War—and how far we need to go in the years ahead.”

This article will discuss some recent examples of how researchers across several disciplines, in some cases partnering with human rights organizations, have applied scientific methods to successfully deal with human rights issues. The idea of scientists collaborating with human rights nongovernmental organizations (NGOs) was reinforced by the launching of the American Association for the Advancement of Science’s (AAAS) Science and Human Rights Coalition in early 2009.

The AAAS chose the sixtieth anniversary of the Universal Declaration of Human Rights as an auspicious time to promote these partnerships and to rededicate its ongoing Science and Human Rights Program, in which scientific organizations and human rights organizations work hand in hand. *Sigma Xi*, a member organization of AAAS’s Science and Human Rights Coalition, declared 2008 as the “Year of Water,” focusing on science, policy, and ethics issues involving access to water as a basic human right.

II. COMBATING BIOTERRORISM: THE ORIGIN OF THE US MAIL ANTHRAX SCARE

“Everyone has the right to life, liberty and security of person.”

“Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits.”

A week after the 9/11 terrorist attacks, lawmakers on Capitol Hill and media outlets in Florida and New York began to receive mysterious mail laden with anthrax spores. Within two months, five people were dead and seventeen others were sickened from contact with anthrax powder, among them several

9. *Id.* art. 27.
US postal workers. Anthrax is an infection caused by *Bacillus anthracis*, a gram-positive, spore-forming bacterium with a high level of genetic uniformity among its dozens of different strains. A few years earlier, Paul Keim, a microbial geneticist at Northern Arizona University, and his colleagues identified thirty-one unique DNA sequences referred to as amplified fragment length polymorphism (AFLP) markers among various anthrax strains.

AFLP can be used as a powerful DNA fingerprinting technique. It uses polymerase chain reaction (PCR) to selectively amplify fragments of genomic DNA of any origin. The AFLP technique allows a large number of DNA fragments to be amplified and detected without requiring knowledge of the sequence of the DNA. Applying this technique to a sample of the anthrax isolated from the body of one of the victims, Dr. Keim identified the attack strain as Sterne-Ames—the most virulent of all anthrax strains. Although different grades of anthrax were used in the attacks, all of them were of the Ames strain.

Under the coordination of the FBI, the then-director of The Institute for Genomics Research (TIGR), Claire Fraser-Liggert, led a team to decode the genome of anthrax DNA (approximately 5 million base pairs). TIGR set out to establish a genealogy of the anthrax cultures, beginning with the Ames ancestor that was isolated from a cow, which succumbed to the disease in Texas in 1981. It turned out that the DNA of the strain used in the terrorist attack was virtually identical to the Ames ancestor—it seemed to be indistinguishable from any of the thousands of known anthrax cultures. Indeed, strains of *Bacillus anthracis* are available commercially.

The New York Times reported in 2008 that an army microbiologist from Fort Detrick, Maryland found a way to distinguish the anthrax cultures by spreading the spores from the anthrax used in the attacks on growth media. The spores grew into various subpopulations, including one with a distinct morphology. This “morph” had a major genetic change referred to as an indel (insertion or deletion of DNA), which gave the strain used in the attack a unique genetic marker.

12. Paul Keim et al., Molecular Evolution and Diversity in Bacillus anthracis as Detected by Amplified Fragment Length Polymorphism Markers, 179 J. Bacteriology 818 (1997); Lance B. Price et al., Genetic Diversity in the Protective Antigen Gene of Bacillus anthracis, 181 J. Bacteriology 2358 (1999).
16. Id.
Over the next two years, seven more such “morphs” were identified and their DNA sequenced. The anthrax spores collected from all of the attack mailings contained four identical “morphs”. Under subpoena of the FBI, 1,070 anthrax samples were collected from laboratories in the US and around the world. Eight of these samples were found to have the same four “morphs” as the strain used in the attacks.\textsuperscript{17}

The source of the eight samples was soon revealed: a master flask of Sterne-Ames anthrax strain referred to as RMR-1029 that was under the custody of Dr. Bruce Ivins, a researcher at the US Army Medical Institute of Infectious Diseases at Fort Detrick. Ivins committed suicide in July 2008, just one month before the FBI made announced the solving of the seven-year-long anthrax puzzle. Such microbial forensics tools can be applied to future biological threats—individuals contemplating such “attacks” can no longer assume that their weapons are untraceable.\textsuperscript{18}

\section*{III. TWITTER AS A TOOL FOR A GRASSROOTS REBELLION TO ELECTIONS IN IRAN}

The will of the people shall be the basis of the authority of government; this will shall be expressed in periodic and genuine elections, which shall be by universal and equal suffrage and shall be held by secret ballot or by equivalent free voting procedures.\textsuperscript{19}

In 2006, Jack Dorsey, a software architect; Evan Williams, an internet entrepreneur; and Biz Stone, a native of Boston, founded Twitter: a real-time, social networking, micro-blog with the goal of helping people stay connected with each other. Twitter, whose motto is “share and discover what’s happening right now, anywhere in the world,” asks one simple question, “What’s happening?”\textsuperscript{20} Answers, which must be under 140 characters, can be sent instantly and widely via the web, text messaging, or instant message.\textsuperscript{21}

The high mobility and simplicity of its use have made Twitter not just an apparatus for people to stay in touch, but also a powerful tool for the benefit of human rights issues. Advancement in information technology helps to promote awareness of human rights issues by enabling quick and accurate dissemination of information on a global scale. Given the ubiquitous use

\begin{thebibliography}{9}
\bibitem{17} Id.
\bibitem{19} UDHR, \textit{supra} note 8, art. 21.
\bibitem{21} Id.
\end{thebibliography}
of mobile devices coupled with the wide accessibility to the Internet and mobile applications, information related to human rights movements, and monitoring violations of these matters can instantly be seen by people all over the world. The faster knowledge is transmitted, the quicker people will be aware of human rights issues globally, thereby providing the opportunity for concerned individuals to react faster and act more appropriately.

With technologies such as Twitter and YouTube, the popular video website, it has become increasingly difficult to prevent the broad dissemination of uncensored information. Despite a potential downside, such technologies can serve as an effective platform for promoting human rights awareness. Other Internet and mobile applications, such as Plurk, Flickr, MySpace, and Google Wave, continue to change and challenge the way we communicate and understand current events.

After Iran held its presidential elections in June 2009 between the incumbent Ahmadinejad and opposition candidate Mir-Hossein Mousavi, the putative landslide win for Ahmadinejad ignited worldwide protests and violent riots in Iran, amid allegations of voting fraud. The cries of protests, heard all over the world, were the strongest on Twitter.22

Twitter’s core technology is a device agnostic message routing system. Messages are compatible with Really Simple Syndication (RSS) and Atom Syndication Format (Atom) formats. Tweets are transmitted over multiple networks, such as the internet (via the Twitter website) and SMS (Short Message Service—for transmission of short text messages between mobile devices); tweets can be received and read on practically any device with a network connection and a screen. Twitterers frequently append notes called hashtags to their tweets, allowing them to be grouped or searched for by topic, and to be retweeted by other Twitterers. The quick-and-easy broadcasting capability of Twitter makes it easy for people to use and difficult for an official entity to censor. With the escalation of the riots and protests, the Iranian government stepped up the suppression of dissent, both in printed media and in online forums. The front pages of Iranian newspapers with news stories were blanked out, and access to many social networking sites such as Facebook were shut down. Western journalists were barred from this region. However, ordinary citizens of Iran continued to deliver compelling, street-level stories, in both English and Farsi, in real time on Twitter.23

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technologies can serve as an effective platform to promote the freedom of speech.24


IV. EYE IN THE SKY: THE WORLD IS WATCHING

In a satellite image captured 2 July 2004 (Figure 1: left-hand image), soil above the purported mass grave at Dasht-e-Leili appeared to be undisturbed, according to Lars Bromley, director of the AAAS Geospatial Technologies and Human Rights project.25 A satellite image captured 5 August 2006 (Figure 1: right-hand image) revealed a large pit on one side of the roadway, and two large vehicles on the other side of the roadway. Based on their dimensions and appearance, the vehicles could have been a hydraulic excavator and a dump truck.26

26. Id.
With the advancement of image acquisition and analysis capabilities over the past two decades, remote monitoring of human rights issues is possible using geospatial technologies. Geospatial imageries such as satellite images taken from space and aerial photographs taken from airborne platforms use color and panchromatic images to capture and rapidly convey information about the natural world as well as human activities occurring on earth’s surface. Moreover, web-based virtual globe applications such as Google Earth and Microsoft Virtual Earth have made such digital images available to all users who have access to a computer and the Internet since 2005. The fast development of sensing technology and an increase of customer requests have led to the acquisition of an array of images of higher spatial resolution and more frequent temporal coverage.27 Commercial satellite sensors such as Ikonos and GeoEye-1 by GeoEye, capture panchromatic images at spatial resolutions of 1m and 50cm, respectively.28 DigitalGlobe’s QuickBird and WorldView-1 satellites are now supplying images with pixel sizes of 61cm and 50cm, respectively.29

Every object on earth can be referenced geospatially using a coordinate referencing system. This geospatial information is used to represent the geographic locations and features of objects on earth’s surface in a digital form. Represented in a so-called raster format, the data contained in the pixel-by-pixel digital form can be measured, analyzed, and disseminated using spatial analysis functions provided by Geographic Information Systems (GIS), which transform the gathered data into information over time and space.30

High-resolution imagery and spatial analysis have found a powerful application in the documentation of humanitarian crises and human rights assessments. Along with their unequivocal timing, the photographs provide authentic, accurate images and sometimes the photographs are the only form that shows the before-and-after visual evidence of damage to houses, fields, and other properties or the shift of human populations. As noted by researchers such as Dr. Amy Ross, from the University of Georgia, who study regions experiencing mass atrocity, there is great difficulty in collecting data for such studies due to the dangers researchers have to face, and the fact that interviews obtained in conflict zones are often precarious and problematic.31 Geospatial technologies thus provide an essential supplement for studying human right issues in these areas.

Lars Bromley, a geoinformation specialist and Project Director of the Science and Human Rights Program at the AAAS, has been using high-resolution digital imagery obtained from satellites to help document large-scale crisis zones in Darfur, Burma, Ethiopia, and other regions. In partnership with human rights organizations including Amnesty International and Human Rights Watch, AAAS obtains images from commercial satellites based on the spatial coordinates of the regions in crisis and analyzes them for evidence of refugee camps, burned villages, leveled fields, and mass graves.

In a series of historical satellite images compiled in 2007, using coordinates provided by Physicians for Human Rights (36.65° latitude, 65.70° longitude), Bromley located and analyzed the suspected site of a mass grave in northern Afghanistan (see Figure 1). The images were acquired by QuickBird, Ikonos, TopSat, and SPOT-5 satellites, operated by a combination of US, British, and French companies. The satellite images from 2004 indicated the absence of pits at 36.65° latitude, 65.70° longitude, while an image from August 2006 indicated the presence of one pit, as well as two vehicles with dimensions and appearance consistent with those of a dump truck and a hydraulic excavator on top of what later developed into a second pit. Images from January and October 2007 indicated the presence of both pits. The timeline of the appearance of the pits and soil disturbance in the alleged site supported allegations of the existence of a mass grave.

As web-based virtual globes are making the once limited-access imag-eraries available to the general public, large-scale human rights violations all around the world can be witnessed, and such information can be distributed broadly and instantly. The US Holocaust Memorial Museum and Google Earth have collaborated to post enormous amounts of evidence of the human rights crisis in Darfur, Sudan. Together with the recently available historical

34. Pinholster, supra note 25.
35. Id.
36. Id.
image viewing function provided by Google Earth, the archived imageries and documents make visible the destructions of over three thousand villages in the region.\textsuperscript{39} Geospatial tools such as remote sensing and GIS offer a transparent recording of the earth’s surface unlike anything available before. Would awareness of an “Eye in the Sky” give a dictator pause, or prevent altogether, an atrocity such as genocide?

V. CONCLUSION

It has been shown that biologists, computer scientists, and geologists, despite the differences in background and specialty, all were able to help advance human rights. It is our hope that these examples will not only inspire professional scientists to contribute their knowledge and skills to benefit human rights issues, but will also serve as powerful case studies for scientists in training.

\textsuperscript{39} \textit{id.}