

trajectory

2018 ISSUE 3

THE OFFICIAL MAGAZINE OF THE UNITED STATES GEOSPATIAL INTELLIGENCE FOUNDATION

Connected *Crisis*

For the United States and its territories, 2017 was a landmark year for natural disasters—and a data-driven turning point for domestic crisis mapping

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- > Special Report: AI at SXSW
- > Q&A with former DigitalGlobe CEO Jeff Tarr
- > GEOINT 2018 Symposium Highlights

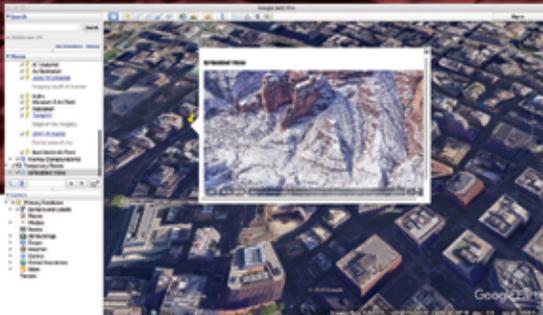


"The reports of my death have been greatly exaggerated."
- Google Earth Enterprise



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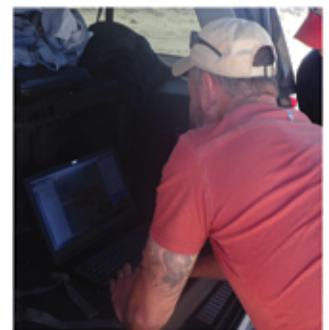
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In coordination with the Office of the Undersecretary of Defense for Intelligence (OUSDI), the National Geospatial-Intelligence Agency (NGA), and the Office of the Director for National Intelligence (ODNI), Google Earth Enterprise (GEE) is available as an Enterprise Service of Common Concern for the Defense and Intelligence community.

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- Support for ultra-high-resolution displays
- New Repair Tool utility to simplify troubleshooting tasks such as clearing the Earth data cache and resetting preferences

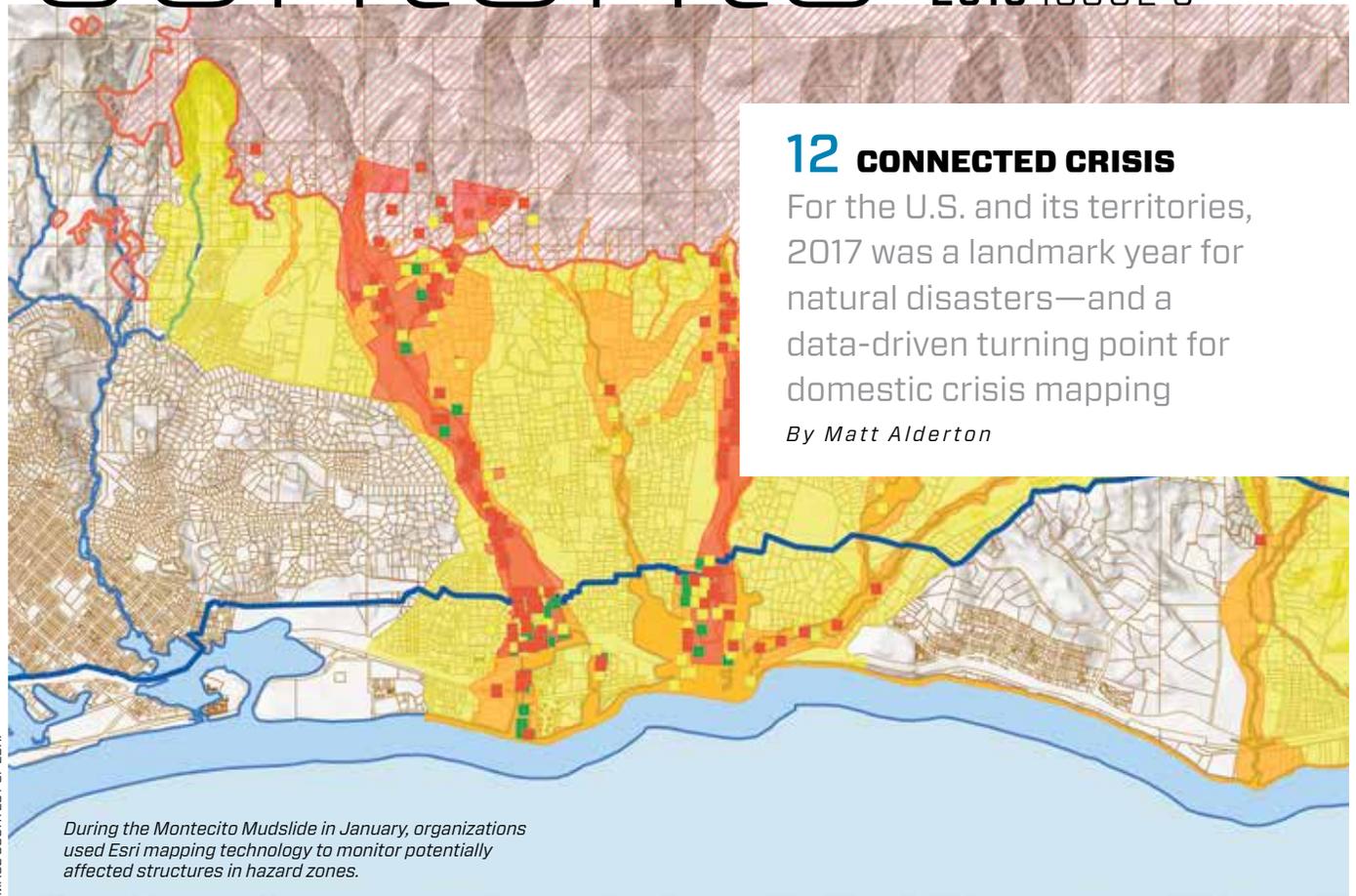


Contact us to leverage this service and begin collaborating with the Program Office coordinating community implementation.

*Per GENSER Organizational message 141715Z DEC 17 NGA has formally rescinded the Google Earth NSGD 1501 Action; Google Earth is sustained by NGA's GVS Program Office via the Google Earth Enterprise Platform for the IC and DoD communities.

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IMAGE COURTESY OF ESRI

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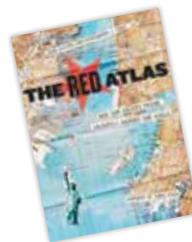
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GOT GEOINT?

Regular blog posts on geography, research & development, GEOINT in mainstream media, and more

COMMUNITY NEWS

Visit us online every Monday for our weekly round-up of all things GEOINT

ON THE COVER:

These satellite images, captured before and after Hurricane Irma, reveal damage at Long Beach, Key West, Florida. Image courtesy of DigitalGlobe

Geospatial Intelligence: The Totally Made-Up Term That's Changing the World

USGIF to host inaugural, commercial-facing trajectoryXyzt event in September

Around 2003, we in the intelligence and defense communities had a problem. Years earlier, we'd forced together remote sensing and imagery analysis with mapping and charting—two distinct disciplines and cultures—to create the imaginatively named National Imagery and Mapping Agency (NIMA). Though we realized the potential advantage this integrated operational approach would provide us over our adversaries, and despite NIMA performing admirably in the wake of 9/11, it simply didn't work as envisioned. Myriad obstacles, primarily related to history and culture, and to a lesser extent immature technologies, complicated our quest.

Taking a few pages from the books of successful change agents, we decided to rally NIMA's workforce around a new vision for a collective future—without disregarding any of the respective heritage organizations and tradecraft. The agency needed a new name and a new operating framework.

After much whiteboarding and brainstorming, we settled on the term "Geospatial Intelligence," which allowed us to acknowledge the mapping and imagery collection and analysis legacies while providing

something new, as well as a new moniker: the National Geospatial-Intelligence Agency (NGA).

Congress added the required language into the fiscal year 2004 National Defense Authorization Act and President Bush signed it into law, but no one in government, industry, or academia (U.S. or abroad) knew what GEOINT actually was. We'd created an internal strategic communications campaign to bring the workforce along—but what about getting the rest of the world excited about this new term and new operational construct?

And so, in the fall of 2003, Geo-Intel 2003 was hastily conceived and executed in New Orleans. This highly collaborative effort, led by a group of government and industry executives who recognized the need to foster discussion around GEOINT, exceeded everyone's expectations. This growing nucleus of a public-private partnership led to the creation of a nonprofit educational foundation—USGIF—to foster the idea of GEOINT, to produce future events, and to germinate the education, training, and professional development to underpin the nascent GEOINT tradecraft.

With a very small staff and a strong cadre of volunteers, the Foundation

has grown from this initial event to an annual GEOINT Symposium with as many as 5,500 attendees and hundreds of exhibitors. Additionally, USGIF has eclipsed 250 member organizations, awarded more than \$1.1 million in scholarships, presented GEOINT Certificates to 800+ students from our 14 accredited academic programs, and developed the standards for a professional GEOINT certification program.

GEOINT is now a commonly used term globally in the defense and intelligence context, and the engagement among government, industry, and academia has been remarkably successful and fruitful. Adoption of the term continues to grow.

As time passed, it became clear that technological advances were combining to create something we termed "The GEOINT Revolution." This included the commoditization of commercial remote sensing, powerful analytic software, ubiquitous precision geolocation data, far-reaching broadband, rapidly advancing processing power, affordable cloud storage, and advanced analytics and visualization.

However, the government and military aren't the only ones affected by the GEOINT Revolution. The features in this issue—a chronicle of crisis

See you at
trajectoryXyzt
September 19-20
The Barker Hangar, Santa Monica, CA

“Those who apply it will have a decided advantage. Those who fail to apply it will ignore the power of GEOINT at their own peril.”

mapping successes during natural disasters that affected the U.S. in 2017, an examination of GEOINT law and policy in the commercial realm, and a special report from SXSW on the state of artificial intelligence—are a strong testament to this.

The expanding application of GIS, the ongoing maturation of location intelligence, and burgeoning business use cases across a number of verticals are sparking further imaginative approaches. GEOINT technology has gone viral, though the term “GEOINT” has not. Some are trying to stretch the definition of GIS, or cram more into the concept of location intelligence than logically fits.

Ironically, the community is at an inflection point where we’re experiencing the inverse of the problem we faced in 2003. We have the near-explosive emergence of a powerful synergy in the commercial world at the nexus of remote sensing from phones to drones to space, geospatial and location information of all types and layers, data analytics, and data visualization...but no term to describe it.

So, USGIF proposes that geospatial intelligence is ready to take its place alongside business intelligence, artificial intelligence, and competitive intelligence in the business world. The GEOINT framework has been in dynamic, iterative development for 15 years.

It’s time to talk about GEOINT in the commercial and consumer marketplace. It’s time to share lessons learned and to crosswalk best practices. It’s time to develop GEOINT practitioners native to the commercial sector. It’s time for GEOINT to be taught in business programs at the undergraduate and graduate level. From precision agriculture, to oil and gas exploration, high-velocity logistics, marketing and retail, smart cities, the Internet of Things, and autonomous vehicles, GEOINT is a key competitive

differentiator. Those who apply it will have a decided advantage. Those who fail to apply it will ignore the power of GEOINT at their own peril.

Drawing from the Foundation’s successful history and internationally established position as a thought leader and convening authority, USGIF will now lead the intellectual charge with respect to the use of the term GEOINT and the establishment of its commercial applied framework.

We’ll launch *trajectoryXyzt* at the Barker Hangar in Santa Monica, Calif., on September 19-20. This first-of-its-kind event will lay the building blocks for commercial efforts at the convergence of geospatial intelligence. The immersive experience will blend visionary keynotes, lightning talks, interviews, technology releases, and deep connections made through engaging networking opportunities.

trajectoryXyzt won’t be just a GEOINT Symposium on the West Coast. While we anticipate many of the companies and attendees at this event will be organizations without any presence in the defense/intelligence communities, we know some of our USGIF members will join us or showcase their commercial offerings. Attendance at this inaugural event will be limited to approximately 500 participants and about two dozen exhibitors.

Taking GEOINT to the commercial sector is an ambitious undertaking, and I hope you are as excited about the possibilities of this event as we are... *trajectoryXyzt* will be unlike anything USGIF has ever presented.

KEITH J. MASBACK | CEO, USGIF
@geointer

trajectory

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INTsider

COMMUNITY NEWS,
EVENTS, AND EDUCATION

 GEOINT 2018

 USGIF NEWS
 GEOINT COMMUNITY NEWS
 EDUCATION
 APPLICATIONS

GEOINT 2018 Symposium Highlights

“For people to be successful, you need to team together and be part of the greater community.”

— **JULIE BAKER, URSA**

“We’re using these automated methods to create more information, but that new information still needs analysis. We’ve really dropped the ball if we don’t think about how humans are going to help us make sense of what it is that we’re processing.”

— **DR. SARAH BATTERSBY, TABLEAU SOFTWARE**

“We are trying to find every human settlement one can identify from these images. Essentially, we are remapping the planet with every settlement and every building one can see.”

— **BUDHENDRA BHADURI, OAK RIDGE NATIONAL LAB**

“There’s more data available now than we’ve ever seen and it presents a massive challenge for us.”

— **LT. GEN. CHARLES BROWN JR., USCENTCOM**

“GEDWorks is not just a new website; it’s a new way for us to do business. [NGA] used truly agile approaches to create this site from concept to launch in just eight weeks.”

— **ROBERT CARDILLO, NGA**

“A humanitarian today should expect that data crunching and analysis should be standard skill sets. Maybe someone here can create a program to teach analytic tradecraft to humanitarians so that we can all speak a common language.”

— **MINA CHANG, LINKING THE WORLD**

“We’ve almost used up the creative acts of our predecessors. Since we can’t draft on them, we—everyone in this room—are going to have to learn to create anew.”

— **SUSAN M. GORDON, PDDNI**



Julie Baker, Ursa



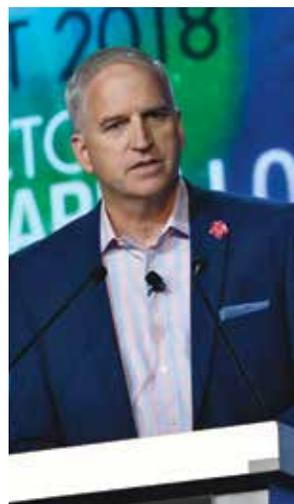
Dr. Sarah Battersby, Tableau Software



Budhendra Bhaduri, Oak Ridge National Lab



Lt. Gen. Charles Brown Jr., USCENTCOM



Robert Cardillo, NGA



Mina Chang, Linking the World



Susan M. Gordon, PDDNI



Scott Hartley, Author & Venture Capitalist



Auren Hoffman, SafeGraph



Dawn Meyerriecks, CIA



Joseph D. Kernan, USD(I)



Gen. Raymond A. Thomas, USSOCOM



Dr. Dave Warner, MindTel

“In Silicon Valley, the narrative was about the importance of coding. Technical literacy as we go forward into this world is necessary, but it’s not sufficient.”

— **SCOTT HARTLEY, AUTHOR & VENTURE CAPITALIST**

“The most important thing about data is that it’s true. The better the data, the more true the data; the more data you have, the less important the algorithms are.”

— **AUREN HOFFMAN, SAFEGRAPH**

“We will fix the background investigation process and the backlog. A cleared and trusted workforce, that’s what the objective is, inside and outside of government.”

— **JOSEPH D. KERNAN, USD(I)**

“This idea that innovation and R&D is ours by birthright—which we have lived on for years and years and years—is perhaps not an assumption that we should continue with.”

— **DAWN MEYERRIECKS, CIA**

“There’s one missing link, and I ask you to think obsessively about it: the customer.”

— **GEN. RAYMOND A. THOMAS, USSOCOM**

“Turns out by using the geospatial information, by using the sociocultural information, I was able to do ‘precision-strike cricket tournaments’ right in the heart of some really bad places.”

— **DR. DAVE WARNER, MINDTEL**



COMPLETE GEOINT 2018 COVERAGE

With so many speakers, presentations, and exhibitors, it would have been impossible to see everything at GEOINT 2018. The *GEOINT Symposium Show Daily* by *trajectory* provided wall-to-wall coverage. Visit trajectorymagazine.com/geoint-symposium for keynote recaps, videos, exhibitor profiles, features, panel discussion overviews, and more!

 PROCRASTINATION TOOLS

Mobile Topographer Free

For improved mobile GPS accuracy and functionality, look no further than Mobile Topographer Free. Surveyors, geographers, and hikers can use the app to calibrate their digital maps, display and convert GPS data into Cartesian coordinates, and observe a sky view of the satellites orbiting 1,200 miles overhead. Other capabilities include height calculation, point projection on maps, exporting point lists, and more.



applicality.com/projects/mobile-topographer-free



MarineTraffic

MarineTraffic provides a comprehensive maritime database, supplying users with a live map showing hundreds of thousands

of ship and yacht locations around the world in near-real time. The app is connected to a vast network of Automatic Identification System receivers, and covers most major ports and nautical shipping routes. Users can also view wind forecasts, animated playback of an individual ship's course, and millions of maritime photos. An augmented reality tool available as an in-app purchase identifies nearby vessels through the device's camera.

marinetraffic.com



Forest Watcher

This app, released by Global Forest Watch, brings forest monitoring and alert systems offline so rangers, environmentalists, and local populations can respond to deforestation and other damage in areas not connected to the web. The organization's GPS system enables offline access to

satellite maps and imagery. Users can monitor custom areas of interest, set deforestation and fire alerts, upload their own datasets, and investigate forest changes in the field.

forestwatcher.globalforestwatch.org

 SOFTWARE

GEOINT Services Aims to Provide Enterprise Offerings Across the IC

Jim Long, deputy director of the National Geospatial-Intelligence Agency's (NGA) GEOINT Services Office, recently gave an update on his office's progress since it was formalized in 2017. Speaking in May at a USGIF GEOINteraction Tuesday event hosted by Tesla Government, Long said GEOINT Services is looking to small teams of developers with geospatial experience to help the Intelligence Community (IC) achieve modernization.

Following the creation of the IC Information Technology Enterprise (IC ITE) and IC resources such as Amazon C2S, GEOINT Services aims to synchronize the delivery of platforms, software, and infrastructure as-a-service to be leveraged across the IC.

According to Long, many capabilities the IC needs already exist, but not as a service. GEOINT Services includes two general categories: backend/IT services such as common development tools available through enterprise contracts; and user-facing services that can be scaled across the enterprise.



 EdGEOcation

LGS Makes Second \$7,500 Pledge

LGS Innovations for the second year donated \$7,500 to USGIF's EdGEOcation Giving Fund. The fund supports USGIF's K-12 educational outreach program, which helps the Foundation create and provide GEOINT learning materials for classrooms, sponsor STEM events, judge science fairs, donate materials to underserved schools, and more.

"Science and technology innovation is our lifeblood at LGS," said Ray Ivie, president of integration and operations solutions for LGS Innovations. "Like most companies in the U.S., it has become more challenging to find and compete for STEM-educated young people. Therefore, we strongly support investment in programs like USGIF's. We chose to support the USGIF EdGEOcation Giving Fund so that we can be directly



LGS presented the \$7,500 check during GEOINT 2018 in Tampa, Fla.

involved with their mission of bringing hands-on STEM initiatives to classrooms to spark interest in young students toward STEM education and careers."

 To learn more about USGIF's K-12 program visit usgif.org/education/K-12.



Jim Long, NGA's deputy director of GEOINT Services, gave an update on his office's progress in May at USGIF's GEOINteraction Tuesday event.

"We are trying to be more transparent in terms of what our needs are," Long said, pointing to software as an example. "Right now, I think [industry is] better postured than we are to show us things to understand the technical competence from an evaluation perspective."

He said NGA is "starting to get back into the business of software" but doesn't intend to build all the software itself.

"The most important thing is we're going to have people who understand software—people who are going to be in leadership positions, who will write better requirements, who will do better evaluations of software and software-facing systems as we move forward."

 SXSW

The CIA's Digital Future

USGIF hosted a special edition of its bimonthly GEOINteraction Tuesday networking event in March—calling it GEOINteraction Monday for its departure from the regularly scheduled weekday—in conjunction with the South by Southwest (SXSW) Interactive Conference in Austin, Texas.

Speakers were Teresa Smetzer, director of Digital Futures for the Central Intelligence Agency's (CIA) Digital Innovation Directorate, and Dr. Bob Metcalf, the inventor of Ethernet and director of the UT Austin Innovation Center.

Smetzer said the purpose of Digital Futures is "to accelerate the identification and adoption of industry-leading technology and processes to solve mission problems."

Digital Futures' goal is to modernize, advance, and transform the CIA mission by leveraging a network of commercial, industry, venture capital, academic, and partner agency expertise. The office also has an Innovation Hub in Silicon Valley it uses as an outpost to identify and assess potential technologies.

Smetzer listed three primary concerns facing Digital Futures: the exponential growth in the velocity, variety, and volume of data; the emergence of disruptive technologies—both as an opportunity for better data management and analysis as well as a threat in the hands of adversaries; and the existence of legacy systems and processes that inhibit innovation and agility.

"We're different in that we start with the mission challenge first," Smetzer said. "We're not looking for cool new technologies, the next big widget, or something that's really a solution in search of a problem."

Smetzer said the CIA is particularly interested in artificial intelligence and machine learning technology such as image recognition, segmentation, anomaly detection, and optimization.

Artificial Intelligence

Artificial Intelligence

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USGIF AWARDS

Recognizing Outstanding Organizations & Individuals

At GEOINT 2018, USGIF announced this year's recipients of its annual Awards Program. The USGIF Awards Program recognizes the exceptional work of the geospatial intelligence tradecraft's brightest minds and organizations pushing the community forward. Award winners are nominated by their colleagues and selected by the USGIF Awards Subcommittee.

THE 2018 USGIF AWARD WINNERS ARE:

- | | | | | |
|---|--|---|---|---|
| <p>1. Academic Achievement Award
Dr. Kathleen M. Carley, professor, Carnegie Mellon University</p> | <p>2. Community Achievement Award
Foundation Career Service Team, National Geospatial-Intelligence Agency</p> | <p>3. Military Achievement Award
Dr. Richard Massaro, USACE-ERDC Geospatial Research Lab</p> | <p>4. Government Achievement Award
Glen Canyon Dam Modeling Team, the U.S. Bureau of Reclamation and Autodesk Inc.</p> | <p>5. Industry Achievement Award
SpaceNet Team</p> |
|---|--|---|---|---|



 LIFETIME ACHIEVEMENT AWARD

Professor Emeritus Honored For Community Contributions

USGIF announced Dr. Edward M. Mikhail, professor emeritus of civil engineering at Purdue University, as the 2018 recipient of the Foundation's Arthur C. Lundahl-Thomas C. Finnie Lifetime Achievement Award. Mikhail was recognized on stage at GEOINT 2018.

Mikhail dedicated 50 years of his professional life to supporting the Intelligence Community. He joined Purdue University in 1965 and established what became a nationally and internationally leading graduate program in geomatics engineering. Although he is retired from the university, Mikhail continues to support the graduate program as a mentor to younger faculty and Ph.D. students. Mikhail's impact can be seen not only through the knowledge imparted to his students, but also in the many books and publications he has authored.

"I am profoundly honored to receive this award," Mikhail said. "As the only educator to be selected, I consider myself very privileged to join such a respected group of outstanding past awardees who have been stalwarts in safeguarding the security and well-being of our nation. In fact, I believe



this award should be rightly given to my former graduate students who have developed into exceptional scientists and engineers, leading the GEOINT Community to cutting-edge technological advances."

The Lundahl-Finnie recipient is nominated and voted upon annually by the USGIF Board of Directors. This distinguished award is named for Arthur C. Lundahl and Thomas C. Finnie, celebrating their accomplishments in imagery analysis and mapping, respectively.

Celebrating a career devoted to supporting the Intelligence Community, USGIF awarded Dr. Edward M. Mikhail, professor emeritus at Purdue University, with the Arthur C. Lundahl-Thomas C. Finnie Lifetime Achievement Award.



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 ONLINE

Trajectory Receives Hermes Website Award

Trajectory, the official magazine of USGIF, won a platinum Hermes Creative Award in May for its website in the category of “Electronic/Social/Interactive Media, Website Overall.” The Hermes Creative Awards is one of the largest competitions of its kind for creative professionals around the globe. Winners range from individual communicators to media conglomerates and Fortune 500 companies. The trajectory magazine website re-launched in April 2017 with robust new content initiatives and the goal to be more user friendly and responsive across all desktop and mobile devices. Visit us at trajectorymagazine.com to see what all the hype is about, and bookmark us to stay up-to-date on the latest GEOINT Community news!



 STEM

Raising GEOINT Career Awareness

USGIF introduced students to GEOINT in April during WashingtonExec’s K-12 STEM Symposium, which was held at the Nysmith School in Herndon, Va. The STEM Symposium is an annual event that educates the community about careers in STEM. The Foundation exhibited in USGIF Organizational Member Altamira’s pavilion, where USGIF staff and members of USGIF’s Young Professionals Group led children through a build-your-own-satellite station. Participants were also given information about satellites and imagery analysis.

 SCHOLARSHIPS

USGIF Announces First K. Stuart Shea Endowed Scholarship Recipient



Sanghui Han, who is pursuing a Ph.D. in imaging science at Rochester Institute of Technology, received the first ever K. Stuart Shea USGIF Endowed Scholarship.

Sanghui Han was awarded the first ever \$15,000 K. Stuart Shea USGIF Endowed Scholarship at GEOINT 2018. Han is pursuing a Ph.D. in imaging science at the Rochester Institute of Technology (RIT) in Rochester, N.Y.

The USGIF Board of Directors announced the creation of this new scholarship at the GEOINT 2017 Symposium in honor of K. Stuart Shea, one of the founders of USGIF and the first chief executive and chairman of the organization. The scholarship will be annually awarded to a Ph.D. student studying cartography, geography, or imaging science.

“Being a single mom and a student is challenging, especially financially,” Han said. “What this scholarship means to me immediately is some breathing room in my finances, which enables

me to better conduct my research. Another facet to this scholarship is the recognition and networking opportunities, which would expand opportunities after I graduate and throughout my career by opening up possibilities for collaboration between organizations that have congruent missions. I hope the connections I make will empower me to bring together my experiences in the military and research at RIT to contribute to the advancement of geospatial intelligence.”

Han earned her bachelor’s degree in mathematics from the University of Colorado, and upon completion was commissioned as a U.S. Army intelligence officer. She began pursuing her master’s degree in imaging science through RIT while deployed to Afghanistan and continued her studies throughout her Army tenure. She completed her master’s degree toward the end of her military career and then began pursuing a Ph.D. in imaging science full-time.

 OUTREACH

Tampa K-12 Students Experience GEOINT 2018

More than 120 K-12 students from the Tampa Bay area had the opportunity to participate in various activities as part of USGIF’s GEOINT 2018 Symposium in April.

“We created a wonderful program for Tampa students this year,” said Lindsay Mitchell, USGIF’s lead educational manager. “By watching technology demonstrations and participating in interactive activities, the children were encouraged to think about how GEOINT is used in their everyday lives. They also learned about the many career opportunities that require GEOINT knowledge and skills.”

Fifteen eighth grade students from Stewart Middle School and 70 fifth graders from Shorecrest Preparatory School attended. The K-12 program was a full day of activities that featured USGIF’s new 35-by-26-foot interactive map of North America called “Portable Planet,” technology demonstrations, a geospatial analysis workshop, and a panel discussion with leaders from academia, government, and industry. Additionally, USGIF’s Young Professionals Group led a data collection activity with Tampa area high school Junior ROTC cadets and human geography students from Franklin Boys Preparatory Academy.

The GEOINT 2018 K-12 program was generously sponsored by AGI, BAE Systems, and Maxar.

Tampa area students participated in activities on USGIF’s new “Portable Planet” map at GEOINT 2018.



 USGIF’s Portable Planet is now available for rental! Visit usgif.org/education/K-12 to learn how to sponsor the map for your local school.



MAXAR

TECHNOLOGIES



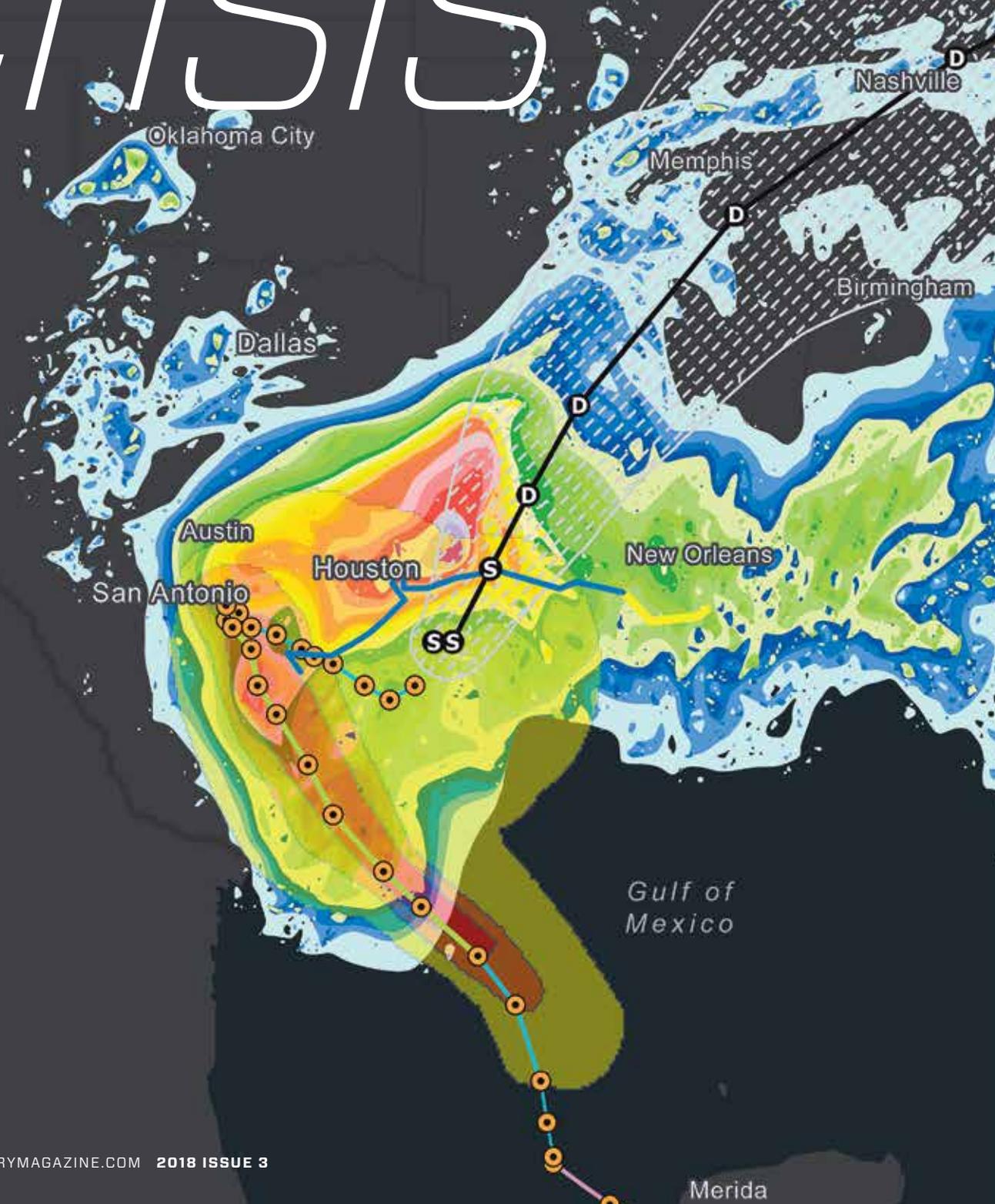
**OUR MISSIONS
REVOLVE
AROUND
GEOINT**

WE'RE FOUR COMPANIES AT THE INTERSECTION OF WHAT'S NEW AND WHAT'S POSSIBLE. We do what no other single company can by delivering integrated solutions to solve our customers' most complex challenges. Together, we're accelerating innovation in the new space economy.

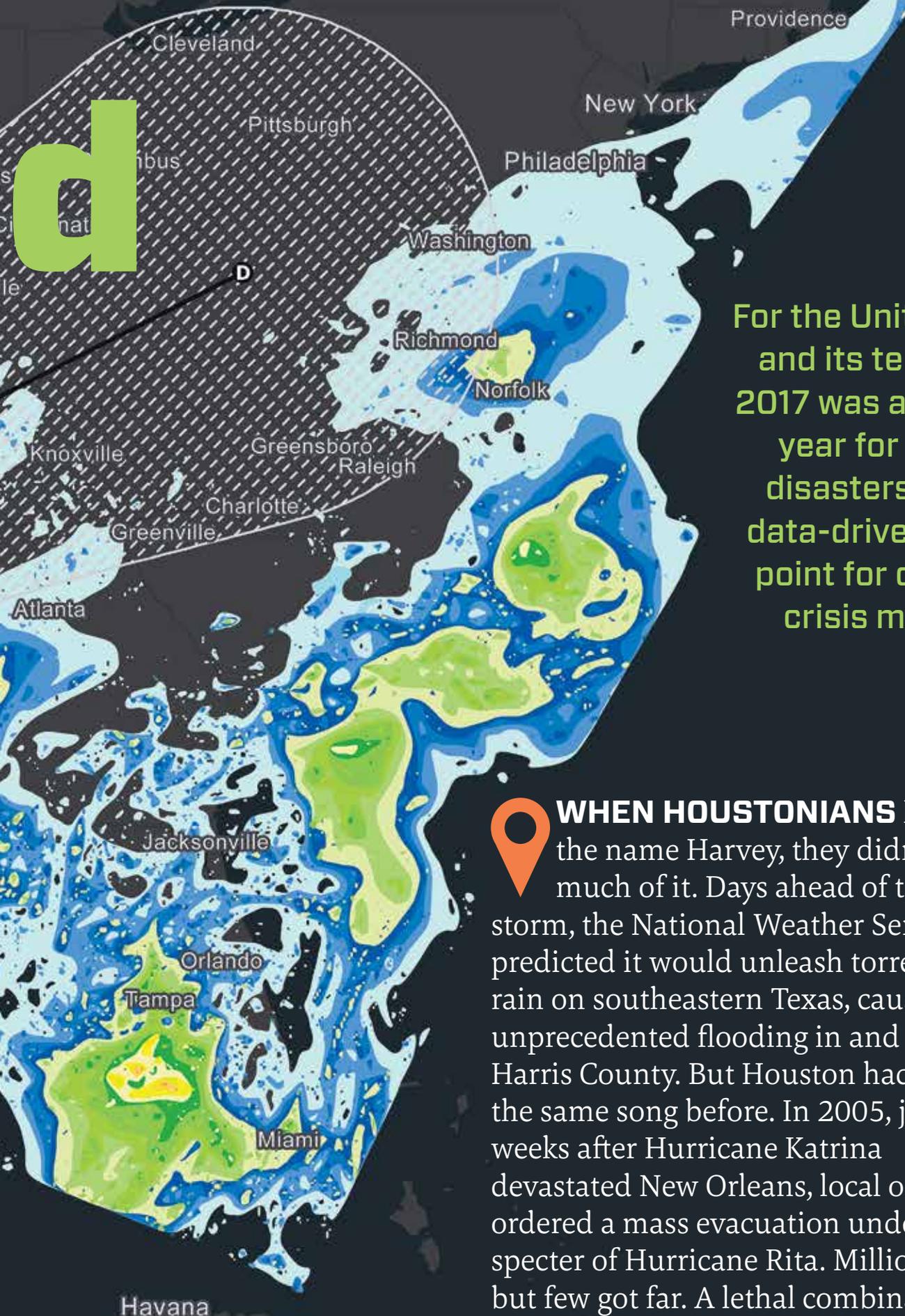
MAXAR.COM

BY MATT ALDERTON

connecte CRISIS



Public safety organizations used Esri mapping technology to track Hurricane Harvey's forecasted path while analyzing anticipated precipitation levels.



For the United States and its territories, 2017 was a landmark year for natural disasters—and a data-driven turning point for domestic crisis mapping

WHEN HOUSTONIANS heard the name Harvey, they didn't think much of it. Days ahead of the storm, the National Weather Service predicted it would unleash torrents of rain on southeastern Texas, causing unprecedented flooding in and around Harris County. But Houston had heard the same song before. In 2005, just weeks after Hurricane Katrina devastated New Orleans, local officials ordered a mass evacuation under the specter of Hurricane Rita. Millions fled, but few got far. A lethal combination of severe gridlock and extreme heat caused >>

“2017 was, in effect, the year of the ‘big data’ disaster. The amount of data generated was so enormous that [disaster response] really became about data management.”

—TED OKADA, FEMA

more than 100 evacuation-related deaths. And when evacuees finally escaped the misery of traffic to return home, most found their streets dry and their homes unscathed. Next time, officials and residents resolved, there would be no evacuation.

But Harvey wasn't a false alarm. After making landfall Aug. 25, 2017, the Category 4 hurricane lost strength and became a tropical storm. Then, it stalled. For four days it meandered along the Texas coast, dropping more than 60 inches of rainfall that caused \$125 billion in damage—the same amount caused by Katrina—and at least 68 deaths.

Unfortunately, Harvey was only the first in a devastating trilogy of storms. Days later, Hurricane Irma ripped through the Florida Keys. Two weeks after that, Hurricane Maria ransacked Puerto Rico. Both mangled the U.S. Virgin Islands on their journeys north.

In 2017, the United States experienced 16 weather and climate disasters with losses exceeding \$1 billion each, according to the National Oceanic and Atmospheric Association (NOAA). Collectively, the crises claimed 362 lives and caused approximately \$306 billion in damage—a new U.S. record.

“It was a very difficult year,” said Federal Emergency Management Agency (FEMA) Chief Technology Officer Ted Okada. “We had numerous catastrophic disasters, any one of which would have been historic in and of itself. It was a nightmare.”

But 2017 also presented an opportunity. Twelve years after Katrina, domestic responders had cause to reflect on how far they'd come. What they saw when they did was a crisis mapping community that has been fundamentally transformed by geospatial intelligence (GEOINT), the pervasiveness of which has made the U.S. and its territories more responsive than ever to natural disasters.

FROM CONTENT TO CONTEXT

Like the separate fibers that constitute a single rope, GEOINT and emergency management are tightly intertwined. They have been since Katrina, when the National Geospatial-Intelligence Agency (NGA) provided stakeholders a common operating picture that saved lives and hastened recovery.

Since then, crisis mapping—the real-time collection, analysis, and distribution of location-based disaster data—has evolved in the wake of numerous catastrophes, each of which has infused the global community with valuable lessons. One of the most significant catastrophes, for instance, was the 2010 earthquake in Haiti.

“There was no mapping data of Haiti when the earthquake hit, so [volunteers] very quickly rallied to build a map of Haiti to help rescuers find homes and navigate roads,” recalled Kevin Bullock, director of business development at DigitalGlobe.

Volunteers once again rallied in 2013, when Typhoon Haiyan tore through the Philippines; in 2015, when an earthquake rattled Nepal; and in 2016, when another quake struck Ecuador. Each time, the crisis mapping community learned and advanced.

But Houston is not Haiti, and Key West is not Kathmandu.



IMAGE COURTESY OF DIGITALGLOBE, A MAXAR COMPANY ©2018

“There’s an interesting contrast between how we respond to a natural disaster internationally versus how we respond when it happens in the United States,” Bullock said. “When the storms hit last year, we were better prepared because local governments, state governments, the federal government, big companies like Google and Apple, and open-source projects like OpenStreet-Map had already mapped Texas and Florida really well. Even Puerto Rico was fairly well mapped.”

It’s the difference between crawling and running. In developing nations, a shortage of remotely sensed imagery and maps means crisis mappers must create content; in developed nations, an abundance allows them to create context.

“Typically, the information that needs to be built in developing countries already exists domestically,” explained Ryan Lanclos, public safety industry team lead at Esri, whose Disaster Response Program (DRP) provides 24/7 support to GIS users during humanitarian crises. “That means the community here can focus on ... the next step—providing additional information to help responders better assess when and where they need to be moving.”

Optimizing the “next step” has become the theme of domestic crisis mapping, according to Okada, who said U.S. responders entered a new phase of emergency management in 2017, fueled as much by data science as natural science.

SATELLITES SAVE THE DAY

“2017 was, in effect, the year of the ‘big data’ disaster,” declared Okada, who said there was an “avalanche” of data in 2017. “The amount of data generated was so enormous that [disaster response] really became about data management.”

One explanation for the data torrent is the promulgation of commercial satellite imagery, according to NGA Chief of Disaster Analysis and Domestic Support Todd Noel.

“The commercial industry has boomed so much during the last two decades that information nobody had access to during Katrina everybody has access to now,” Noel said.

And he means everybody.

“During Hurricanes Harvey, Irma, and Maria, our representatives were inundated with phone calls from

regular people like stay-at-home mothers who had evacuated and wanted to know if their house had survived the storm,” said DigitalGlobe’s Bullock. “We saw a huge influx of people who now understand the power of remote sensing.”

To satiate the growing appetite for commercial imagery during and after disasters, DigitalGlobe in 2016 launched its Open Data Program, through which it releases high-resolution satellite imagery in support of the humanitarian community. The program includes an activation protocol and a centralized data portal so responders know ahead of time what imagery DigitalGlobe will release and under what circumstances.

DigitalGlobe’s open imagery was especially helpful during Harvey because it included not only optical imagery, but also synthetic aperture radar (SAR) imagery from RADARSAT-2, which became available to DigitalGlobe in 2017 after the company was acquired by RADARSAT-2’s Canadian operator: MacDonald, Dettwiler, and Associates (MDA).

“With radar, we can operate at night or when there are clouds in the way,” Bullock said. “Because we had access to RADARSAT-2, we were able to create and release flood maps that showed the extent of flooding while the storm was still over Houston.”

GEOINT products such as this help create clarity in times of chaos.

“I spoke to a colleague who lived in Houston during Harvey, and he described it as a ‘fog of war,’” Bullock said. “Communications were spotty and nobody knew where to go for relief. With remote sensing, we can be a source of truth to let people know exactly where to go and what’s the best way to get there.”

CALLING ON THE CROWD

Of course, commercial satellite imagery is not the only milestone in the history of emergency management. Another is the rise of social media. Data from both converge for crowdsourced initiatives, which in 2017 took on new significance within the domestic emergency management community.

The crowd has already been established as a vital resource in developing nations, around which volunteer mappers mobilize after a disaster to create much needed base maps. In developed nations that already possess content, the crowd can help provide context instead.

In 2017, the crowd proved it could deliver this context thanks to volunteers like Jessica Decker and Joe Larson. The former is a front-end developer and cartographer who moonlights as a volunteer crisis mapper. When Harvey hit Houston she took to social media in search of crisis mapping initiatives to join from her home in San Francisco. When she couldn’t find any, she decided to start one using Fulcrum Community, the free version of Fulcrum, a mobile



IMAGE COURTESY OF JESSICA DECKER/SPATIAL NETWORKS

Organized by Jessica Decker, 700 volunteers came together online to map locations of shelter, food distribution, medical aid, and more in the days that followed Hurricane Harvey’s devastation of Houston.

“The commercial industry has boomed so much during the last two decades that information nobody had access to during Katrina everybody has access to now.”

—TODD NOEL, NGA

app developed by Spatial Networks to facilitate field data collection during humanitarian crises.

“We’d heard a lot of reports about people asking for assistance, but we didn’t see any real response yet by an official organization,” said Larson, an integration engineer at Spatial Networks. “So when Jessica submitted an appeal to provision a Fulcrum Community instance for Harvey, we said, ‘Absolutely.’”

Together, Decker and Larson mobilized a remote community of digital volunteers who collaborated via the messaging app Slack, then used a mélange of source material—including social media posts, commercial satellite imagery, news reports, and even firsthand accounts from Houstonians—to map ground truth for the benefit of citizens and responders.

“The storm hit on Friday and we scaled up to 700 volunteers worldwide just over the weekend,” said Decker, who with Larson created videos and training materials on the fly to onboard volunteers. “The entire operation took place online; I didn’t leave the room I was in for the first five days.”

Volunteers mapped more than 1,400 resources, including medical facilities, food drop-off and distribution centers, shelters, animal hospitals, and more.

Thousands of Harvey survivors, rescuers, and volunteers likely benefited from Decker’s Fulcrum map and other crowdsourced resources, such as Digital-Globe’s Tomnod.

“Tomnod is an extremely effective tool in crisis response,” said Bullock, adding Tomnod has a community of approximately one million registered users. “By dispersing millions of chips of images to thousands of people, we’re able to very quickly crawl through imagery and do a damage assessment.”

BRINGING GRASSROOTS TO GOVERNMENT

Crowdsourcing can be just as vital during domestic disasters as international ones. But the Americans who most need the crowd’s help during a domestic crisis—federal responders—have been slow to accept it.

“Especially when it comes to sudden onset disasters, the need for collaboration between

formal responders and volunteers is big but far underdeveloped,” explained Norwegian crisis mapper Per Aarvik, president of Standby Task Force, a global network of volunteer crisis mappers. “Formal responders have certain parameters for things like security and training, and that can make collaboration risky.”

In 2017, federal responders conceded: The benefits might justify the risks.

Federal agencies have experimented with crowdsourcing since at least 2012, when Hurricane Sandy pummeled the East Coast. At that time, FEMA recruited crisis mappers from the Humanitarian OpenStreetMap Team (HOT) to help it conduct damage assessments and solicited data from commercial entities like Waze, whose popular traffic app helped it identify gas shortages. But efforts since have been ad hoc and haphazard.

That changed last year, starting with the U.S. Coast Guard (USCG).

“During Hurricane Harvey, two [USCG Academy] cadets, under their own initiative, began combing social media looking for reports of people in distress. The cadets then created heat maps to show areas of high impact and sent updates three times per day to search and rescue coordinators in New Orleans. These products ... supported the more traditional methods used by search and rescue coordinators to locate people in distress,” said USCG spokesperson Lt. Amy Midgett.

The grassroots effort—which marked the first time the USCG used crowdsourced social media for disaster response—was supported by Standby Task Force and another crisis mapping organization called Humanity Road. The cadets ultimately mapped 1,000 search-and-rescue cases involving 5,200 people.

Like other federal efforts before it, the campaign was informal, finite, and fleeting. Nevertheless, it was a catalyst for significant change, according to FEMA Geospatial Information Officer Christopher Vaughan, who used it as inspiration for his own, more official operation.

“They were doing a really innovative thing, and we wanted to sponsor or encourage it. But it was their show,” said Vaughan, who saw an opportunity to carry the USCG’s baton when Harvey gave way to Irma. “I talked to our senior leadership about using crowdsourcing and ... their response back to me was, ‘If not now, when?’”

Lt. Christopher Capule, an Air Station Corpus Christi pilot, monitors the weather as Hurricane Harvey approaches the Texas coast Aug. 24, 2017.



PHOTO BY U.S. COAST GUARD PETTY OFFICER 3RD CLASS, JOHANNA STRICKLAND



PHOTO COURTESY OF HUMANITY ROAD

Coast Guard Academy Cadet Evan Twarog shows a heat map in the academy's GIS lab on Sept. 1, 2017.

EMERGENCY ECONOMICS

People's lives aren't the only things that must be saved during a disaster. Their livelihoods also must be rescued.

GEOINT can help, according to business intelligence firm Dun & Bradstreet.

"When a disaster occurs, Dun & Bradstreet provides geo-located data that enables situational awareness on the economic activity in the forecasted impacted location or the actual impacted location," explained Dun & Bradstreet Director of Predictive Analytics Adrianna Rockford, who said examples of economic situational awareness data include geo-coded data on business counts, jobs, annual sales, business size distributions, industry codes, measures of financial

health and business viability, and business age/maturity. "It is our hope that this economic situational awareness baseline data helps the emergency management community prioritize access and re-entry activity, prioritize infrastructure repairs and construction, understand the types of businesses that make up the impacted local economy, calculate and justify recovery funds, and ultimately ensure that the financial assistance programs that result from a disaster situation reach the right businesses."

Dun & Bradstreet began providing data to state and local Emergency Operations Centers, as well as the Federal Emergency Management Agency, for the first time in 2017.



"Before 2017, we published our economic situational awareness to our website and our commercial customers digested that information to make better-informed decisions," Rockford said. "Only since the end of 2016 through 2017 have our data, analytics, and econometrics been actively used by the emergency management community."

Vaughan recruited U.S. Geological Survey (USGS) Innovation Specialist Dr. Sophia Liu, who under a FEMA mission assignment stood up the organization's first-ever crowdsourcing desk.

"It's the most official we've ever taken crowdsourcing," continued Vaughan, who said the desk reached peak performance when Maria made landfall in Puerto Rico. "Power and communications were out, our stream gauge sensors weren't working as well as they could have been, and there was persistent cloud cover. So we didn't have our normal sources of information coming off the island, such as impacts to roads, bridges, and hospitals. That's when we turned to crowdsourcing and ramped up our efforts."

Under Liu's direction, more than 5,000 digital volunteers converged from HOT, Standby Task Force, and others. Collectively, they converted tens of thousands of images from the Civil Air Patrol into actionable insights.

"That gave us some of the earliest pictures we had of impacts, and faster than we would have had them if we'd waited for the power to come back on and for traditional information to start flowing again," Vaughan said. "It was amazing."

The volunteers thought it was amazing, too.

"This was a very significant event for FEMA and crowdsourcing," said Russell Deffner, a project manager and crisis mapping lead for HOT. "It was a great collaboration and an eye-opener for the U.S. government to see crowdsourcing as a potential resource."

Now that they can appreciate the crowd, Deffner and Vaughan agree, the feds must determine how to institutionalize it.

"There has been a perspective change," Vaughan said. "There is now acceptance and openness toward using these tools in what has traditionally been a very rigid system."

Advancing that goal is a fledgling effort to develop a "Crowdsourcing Playbook" that will standardize when, how, and toward what end FEMA will use crowdsourcing.

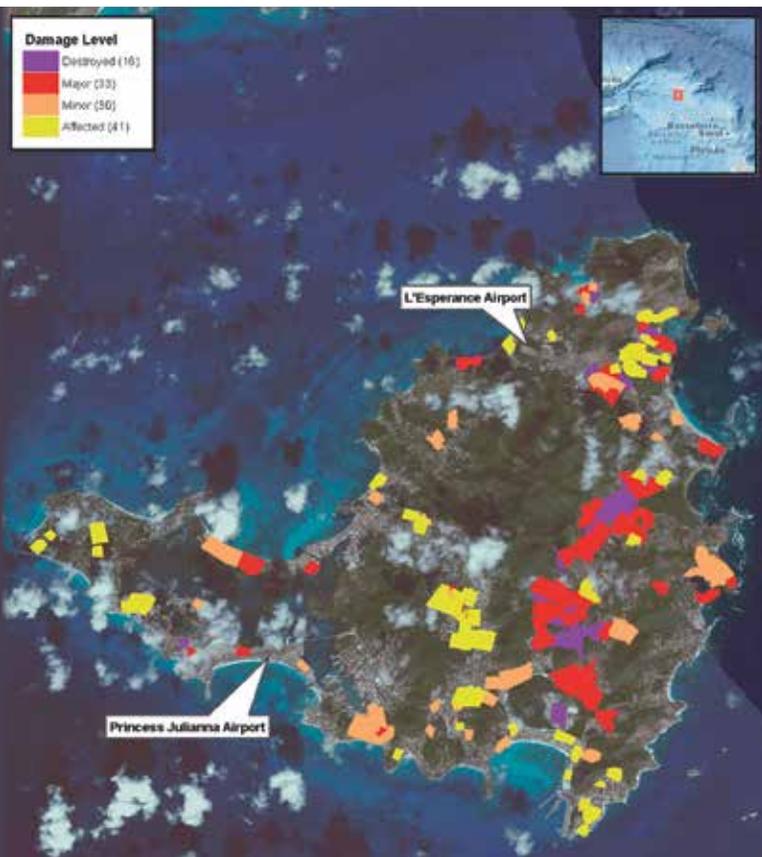
"If there's an event we're needed for, we're going to activate no matter what," Deffner said. "What FEMA has realized is that if we're going to activate anyway, they might as well direct us so that we can contribute what they need the most in order to save people."

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Preliminary damage assessments of St. Martin from Sept. 9, 2017. The yellow, orange, red, and purple areas mark damage levels as affected, minor, major, and destroyed, respectively.

“As I reflect on 2017, I think our dedicated focus on standardization was the seminal thing that carried the day.”

— CHRISTOPHER VAUGHAN, FEMA

THE DIGITAL DILEMMA

The value of crowdsourcing is obvious: More people yield more data, and more data yields better emergency response. But there’s a potential downside, too: Without the right governance in place, data can obscure instead of illuminate.

“More and more information is coming at us, and we’ve got to do a better job of organizing it and structuring it so people can actually consume it,” Vaughan said.

To make sure it can leverage data effectively, FEMA has spent the last three years standardizing its geospatial products around six themes: hazard identification, resource needs, population impacts, building impacts, transportation impacts, and infrastructure threats. In the wake of a disaster, it now delivers 21 standard products derived from those six themes. The result, according to Vaughan, is a template approach to GEOINT produc-

tion that increases speed and efficiency, which gives FEMA more capacity to ingest information.

“As I reflect on 2017, I think our dedicated focus on standardization was the seminal thing that carried the day,” Vaughan said.

An outcome of standardization was more mature data models with which to conduct damage assessments, which have reduced FEMA’s reliance on external partners.

“We’ve built our own internal capabilities such that we’re able to stand on our own two feet,” Vaughan said. “Where we traditionally relied on NGA for their analysis, we’re now able to do that ourselves.”

NGA’s Noel said the organization has welcomed the change.

“Last year was a banner year for disasters, but it also represented a big change for NGA in terms of how we support our domestic partners,” Noel said. “In fact, Harvey was one of the first times that there was no request from FEMA for NGA analytical support.”

Most NGA analysts are devoted to intelligence problems. Fewer FEMA requests means those who work on disaster analysis can devote their time to more sophisticated analytic pursuits.

“That doesn’t mean NGA is off the hook,” Vaughan said. “In fact, we have a very positive relationship with NGA, and they’re still very much supporting our mission” by supplying all the foundation imagery on which FEMA’s models run.

“That’s where the future for NGA is really going to be,” echoed Noel. “It’s about providing the data.”

Although the role of “data steward” sounds peripheral, it’s actually critical. Consider, for example, NGA’s work in Puerto Rico in the aftermath of Maria. While FEMA did not request analytic assistance from NGA during Harvey or Irma, the stress of a third storm necessitated reinforcements. At FEMA’s

request, NGA sent two analysts—Michelle Nichols and Grant Eaton—to Puerto Rico to provide onsite GEOINT support. Upon arrival, they found as much digital disarray as physical destruction.

“When we got there, FEMA was stretched pretty thin; it was a huge operation with very little geospatial support,” explained Nichols, who said there was a “disconnect in data”—an abundance of data, but a deficit of governance to exploit it. Responders lacked a common operating picture, which caused inefficiencies like duplicate deliveries; while some survivors received extra provisions, others received none.

To bring focus to a blurry landscape, Nichols and Eaton served as data conduits that standardized, organized, and disseminated geospatial information.

“Having very good data organizers is really important from the get-go,” Noel said. “If you walk into a disaster, and you have a lot of people there who are providing data, you need people to catalog it and organize it and make it usable to folks when they finally need it. That’s what Michelle and Grant were able to do, and moving forward we’re working with FEMA to ensure there are a lot more people like that available to actually manage the data.”

FEMA is also pursuing efficiencies with the help of technology, starting with dissemination. The sheer number of data sources available makes it difficult to discover them. FEMA has launched a data repository—disasters.geoplatform.gov—where it will curate authoritative apps, services, datasets, and APIs from the public and private sector to give responders a one-stop-shop for data discovery.

One of the apps currently available is Hurricane Incident Journal, which speaks to another FEMA strategy: automation. Whenever the National Hurricane Center announces a hurricane advisory, Hurricane Incident Journal automatically captures data and flows it into pre-made models that generate standard mapping products inside the application.

“Eventually, my dream is that we’ve got everything set up in such a way that as an incident starts to unfold, the analytics will start to roll out without any human intervention at all. It will be like a very complex domino set where one workflow kicks off another workflow,” said Vaughan. “I don’t think we’re very far away from that.” 🌐



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**As technology
advances,
legislatures and
courts lag behind**

GEOINT **law+policy**

BY ROB PEGORARO

is a poorly mapped and expanding

frontier

 **EACH YEAR**, the reach of our electronic senses extends further beyond that of our physical senses—and the law isn't keeping up. The resulting gap between what geospatial intelligence (GEOINT) can achieve and what the law prohibits isn't uniform either. While federal lawmakers stall, many state legislatures are passing restrictions of their own—and actions by the European Union and the developers of mobile app platforms are establishing additional limits. In short, with no map to follow, geospatial law and policy is proving increasingly difficult to navigate. >>

“If you build the toll road, you get to decide what the toll gate looks like, what the road is made of, and how fast people get to drive. And that is going to impact innovation.”

— GERRY STEGMAIER,
REEDSMITH

LOST ABOUT LOCATION DATA

“The law is many steps behind,” said Jennifer Lynch, a senior staff attorney with the Electronic Frontier Foundation. And that’s especially the case, she added, in the realm of geo-location.

Instead of broad federal standards, the United States has laws that predate the concept of GEOINT by decades, plus more recent court rulings that don’t always offer much guidance.

Telecommunications carriers have long been prohibited by section 222 of the Communications Act of 1934 from selling proprietary customer information, a provision that clearly covers location history.

No such law, however, covers the commercial use of location data collected by a smartphone’s operating system or apps.

Law enforcement agencies, meanwhile, are free to request location history without a warrant under the “third-party doctrine” which says once customers provide such data to a company, the authorities no longer need to secure their permission to search that information.

The closest the Supreme Court has come to visiting this issue came in 2012, when Justice Sonia Sotomayor wrote in a concurring opinion that location data offers “such a substantial quantum of intimate information about any person” that “it may be necessary to reconsider the premise that an individual has no reasonable expectation of privacy in information voluntarily disclosed to third parties.”

But the case at stake, *U.S. v. Jones*, covered a much more aggressive form of location tracking: Police surreptitiously attached a Global Positioning System tracker to a suspect’s vehicle for months.

It’s taken another six years for the court to deal directly with access to location history. In *Carpenter v. U.S.*, a ruling as to whether police violated a suspect’s rights by acquiring 127 days of his cellphone location data without securing a warrant will come sometime before the end of June.

SOME STATES GO THEIR OWN WAY

Meanwhile, location data keeps advancing—even the crudest sort derived by calculating a phone’s position based on signals from nearby cell towers.

“A cell tower might have been five miles from you,” Lynch said. “But now if you go to a city, there are so many towers, the technology can place you in front of a building.”

The discovery in May that LocationSmart, a geo-data aggregator in Carlsbad, Calif., had not only been purchasing cell-site data but inadvertently leaking it via a bug on its site dramatized the risks of this rising tide of cell-site information.

Smartphone-based techniques can be far more precise. At its I/O developer conference in May, Google showed how its software will be able to geo-locate a user within a meter or two, indoors and out, by referencing precise time stamps from compatible WiFi access points or matching a phone camera’s view with the company’s enormous Street View database.

Congress doesn’t have to wait on the Supreme Court to set limits on law enforcement use of this data, but it has chosen to do so—the legislative branch has spent nearly a decade failing to pass any reform to the outdated Electronics Communications Privacy Act of 1986.

As a result, some states have grown tired of waiting. In 2013, Montana enacted a law requiring law enforcement to obtain a search warrant before requesting a suspect’s location history. Three years later, California followed suit.

“I think we will continue to see more movement at the state level. This Congress can’t seem to pass anything, and certainly not anything related to privacy,” Lynch said.

THE CAMERA EYE

In addition to location information, remote sensing data has also marched well past existing legal norms.

When satellite and aerial imagery amounted to photography from a few hundred feet or miles up, there was little to worry about—nothing personal was visible.

“Those sorts of uses of geographic data don’t raise any privacy concerns because they’re not being associated with individuals,” explained Kurt Wimmer, a partner with Covington & Burling LLP in Washington, D.C.

But cameras have grown smaller, sharper, and more widespread. And in some situations, courts have held that there’s such a thing as too close. In 2001, the Supreme Court ruled in *Kyllo v. U.S.* that police use of an infrared camera from the street to peer inside a house’s walls constituted an illegal search.

Similarly, courts have allowed law enforcement use of aerial surveillance because flight safety principles alone ensure any such flights occur well above an individual’s backyard—at least 400 feet away.

A set of 1980s Supreme Court rulings on helicopter-based surveillance permitted that practice but offer little insight on drone use; Lynch described them as “really bad case law” in the context of unmanned aerial vehicles.

In one of those older rulings, *Florida v. Riley*, however, Justice Sandra Day O’Connor wrote a prescient concurring opinion: “Imagine a helicopter capable of hovering just above an enclosed courtyard or patio without generating any noise, wind, or dust at all—and, for good measure, without posing any threat of injury.”

Today, cameras can also document the threshold of a private residence from a motor vehicle—as Google’s Street View photography demonstrates.

Since roads and sidewalks are public thoroughfares, there hasn’t been much debate surrounding Google’s right to collect these images. In 2010, Google agreed to pay a token settlement of one dollar to two Pennsylvania

Cellphone antennas in midtown Manhattan.



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“The real driver has been the Apple and Android developer terms, which require true opt-in consent prior to collection of specific geo-location data.”

— KURT WIMMER, COVINGTON & BURLING LLP

homeowners—but only because its Street View car went down their driveway.

Not long after launching Street View in 2008, however, Google began blurring out faces and license plates in Street View.

“Initially they didn’t blur out anything,” said Gerry Stegmaier, a partner with ReedSmith in Washington, D.C., whose then-employer Wilson Sonsini Goodrich and Rosati has long represented Google. But, he added, most of the credit for this move comes from outside the U.S. “The real pressure came from Europe, and it was just easier to have it work one way.”

A decade later, automatic license plate readers have become commonplace tools for police departments—but laws governing their use are not. In April, Virginia’s Supreme Court suggested in a ruling that while merely recording a plate number in a database could be permissible under state laws, the actual images collected “of the vehicle, its license plate, and the vehicle’s immediate surroundings” required a lower court to revisit an earlier ruling approving the Fairfax County police department’s use of this technology.

It remains rare for a company or government to work upfront to minimize the personal data harvested from public sensors. But in Toronto, Google’s Sidewalk Labs smart-city project—an ambitious plan to transform a section of the city’s waterfront—is championing the principle of data minimization.

“Our goal has been to ensure that any data that are collected from sensors or IoT or whatever are de-identified at source,” said Ann Cavoukian, a Google Sidewalk advisor and former Ontario privacy commissioner, in May at a conference in Toronto. She added this would, “render the risk of re-identification to less than .03 percent.”

OUTSIDE FACTORS: APPLE AND GOOGLE’S RULES AND EU REGULATIONS

In the absence of clear guidance from federal or state laws, other stakeholders

can influence the use of geospatial data. In particular, the rules of Apple’s App Store and Google’s Play Store might as well be the law when it comes to mobile apps.

“For the more routine types of geo-location data that we’re all familiar with, the real driver has been the Apple and Android developer terms, which require true opt-in consent prior to collection of specific geo-location data,” said Wimmer. “Because this data is far more valuable on devices that are running iOS or Android, the gatekeeping function of these operating systems has been the ‘law’ that has created a prior consent requirement.”

In May, for instance, Apple removed a round of applications from its App Store—a death sentence for the app providers since iPhones allow no other way for customers to install these apps—because they shared location data with third parties without first acquiring user permission.

As Stegmaier put it: “If you build the toll road, you get to decide what the toll gate looks like, what the road is made of, and how fast people get to drive. And that is going to impact innovation.”

Across the Atlantic, the European Union’s General Data Protection Regulation (GDPR), a sweeping bundle of restrictions on corporate use of data, may compel further changes in U.S. apps that deal in geo-location data. As Google found with Street View, it’s often easier to maintain the same set of features worldwide.

WHAT’S NEXT?

Privacy advocates point to the advent of facial recognition technology as the most alarming application of sensors to identify and track people—dubbing the technology far more intrusive than using cameras to spot license plates on a car that could be driven by any of a few people in a household.

“Facial recognition allows for the identification of individuals without their consent,” said Jeramie D. Scott, national security counsel at the Electronic Privacy Information Center, adding that this “poses a special risk to the [U.S.] First Amendment rights of free association and free expression.”

But technology vendors are moving quickly to build this feature into law enforcement gear—both because such U.S. agencies as the Department of Homeland Security want to deploy it in airports and at borders, and because countries such as Russia and China are even more keen on applying this technology.

When these facial recognition cameras operate in public, opting out becomes tricky if you don’t want to look like you’re about to rob a bank. As Scott observed, “Participation in society generally involves exposing one’s face.”

Lynch voiced a wish for more transparency. EFF and others support state laws requiring, as she said, “that all of the purchasing be conducted out in the open, and that law enforcement agencies have strict auditing requirements and reporting requirements.”

Maybe enough states will step in. Maybe the Supreme Court will counteract Congressional inertia. Maybe the next Congress will change course—with some tech-industry leaders like Salesforce CEO Marc Benioff now calling for a U.S. equivalent of the GDPR, the political climate is changing.

But without thoughtful and concerted oversight at the federal level, the risk for the entire U.S. is the same as for individual users who install a new location tracking app on their smartphones: Putting a technology into service first and asking questions later can lead down paths without a U-turn. ☹

Interested in learning more about GEDINT Law and Policy? Get involved with USGIF’s Geospatial and Remote Sensing Law Working Group! The group aims to educate its members on legal issues and developments related to geospatial information. Email GRSLWG@usgif.org to learn more.



“You can’t hit what you can’t see.”

- Muhammad Ali

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the state *of* AI

BY KRISTIN QUINN



“HUMANS TEND TO overestimate technology in the short term but underestimate it in the long term,” said Tom Foster, editor at large for *Inc.* magazine, during a panel he moderated on innovations in machine learning at South by Southwest (SXSW) in March. Artificial intelligence (AI) was a recurring theme across panels at SXSW 2018’s Interactive Conference held in Austin, Texas. The topic was particularly popular in tracks titled “Intelligent Future” and “Startup & Tech Sectors.”

Many AI experts marveled at recent advances in the technology while pondering its future.

“I’ve been working in AI for now more than 30 years and in the past eight years there are things that have occurred that I never thought would happen in my lifetime,” said Adam Cheyer, co-founder of Viv Labs, during a discussion on innovations in AI. He gave as examples IBM’s Watson supercomputer answering *Jeopardy!* questions in natural language and the ability for AI to recognize objects in an image then synthesize the meaning of that image.

According to Cheyer, who is also known as one of the co-founders of Apple’s Siri, we’re on the brink of a new paradigm. He noted the way people interact with computers changes roughly every 10 years—beginning with the PC, then the web browser, followed by the smartphone—and predicted the next evolution would be in the advancement of artificially intelligent assistants such as Alexa and Siri. He also described today’s assistants as utilities that can’t do everything the web or an app can, but anticipates this will soon change as companies pour billions of dollars into creating a scalable ecosystem.

“I believe within the next two to three years you will use an assistant for everything you use the web and apps for and it will be better than either of them,” Cheyer said, giving traveling to a wedding as an example.

Imagine an AI assistant that knows your preferences and can engage in complex task coordination on your

behalf—arranging your travel and hotel, what you will wear, what gift you will bring.

“It will be a paradigm more important than web and mobile and at a scale where every connected human and business will be transformed—and we’re this close.”

NARROW VS. GENERAL AI

Though Cheyer posits AI’s competence in application areas (narrow AI) will have the power to change lives, he said general AI has made slight progress, but “nothing beyond that of what any two-year-old can do.”

A panel exploring the power of narrow AI, also called vertical AI, outlined the differences.

Amir Husain, founder and CEO of SparkCognition and author of *The Sentient Machine: The Coming Age of Artificial Intelligence*, said all of the investment going into AI today would be “paid back manifold” by vertical applications.

Vertical AI is the ability to perform a specific task at the human level of performance or better, such as classification, image processing, speech recognition, and finding patterns in data. Conversely, artificial general intelligence, sometimes referred to as AGI, is the ability to perform more complex tasks such as playing chess, composing a song, or arguing a lawsuit.

“When an app can look at a cancer diagnosis and provide results better than a human doctor, when an autonomous car can ... control a car in a safer way than a human, when a weapon system is able to guide itself without the aid of the pilot—when it can only do that one task with reliability and accuracy—that is narrow AI,” Husain said. “Today, that is where we are poised. That is not to say we aren’t going toward more generalized AI.”

According to Husain, current achievements center around the ability of AI to effectively perceive—recognizing an image and the objects within it, making sense of text, converting sound into text, and so forth. But, he continued, progress will occur when this automated perception is woven with other AI applications to evolve from observation to decision, simulation, and action.

“Are you interested in just pulling in some data from a database and seeing a fancy chart that says, ‘I think this is an anomaly?’ Come on, that’s so 1979,” he said. “What’s really interesting is how you start reasoning and how you

start to build a case for action, and then enable that action in a way that's explainable."

John Price, CEO of vast.com, said success is about more than "just spinning up a great vertical AI app." He outlined the importance of knowing where you're going to get quality data, developing an effective and scalable business plan, and knowing how users will interact with the AI and how it will present information.

"Users don't want information from the AI, they want to be told what to do," he concluded.

HOW CLOSE IS THE SINGULARITY, REALLY?

Though AI technology has barely transitioned beyond vertical applications, and consumers worldwide would surely admit to occasionally yelling at their Alexa devices in frustration, multiple panelists referenced the singularity—often defined as the point of no return at which artificial intelligence surpasses human intelligence, or at which humans and machines merge, or both. SpaceX's Elon Musk and Google's Larry Page, who believe AI is a great threat to the world, and that it has the power to change the world for

good, respectively, were referenced multiple times as examples of extreme perspectives concerning the technology's future. While some believe Musk's hesitation could stifle progress, others fear Page's total embrace of AI goes too far.

Famed physicist Steven Hawking shared Musk's skepticism, and wrote in 2014: "If a superior alien civilisation sent us a message saying, 'We'll arrive in

a few decades,' would we just reply, 'OK, call us when you get here. We'll leave the lights on?' Probably not—but this is more or less what is happening with AI."

But, realistically, how pressing are concerns about the future of humanity in the age of AI? Some experts anticipate the singularity is closer than most realize, such as futurist Ray Kurzweil, who pinpoints the year of singularity as early as 2045. Other experts, such as Cheyer, think that date is still roughly 1,000 years out.

"The real fear is [if] sentience emerges. I'm [an advisor to] a company called Sentient, and I can tell you we do not know how to do sentience," Cheyer said, describing sentience as the ability to think, reason, feel, and scheme. "We don't even know what consciousness is. I haven't seen any work that is leading in that path ... I think most in AI take that view, which is quite different than what the media blows up."

Daphne Koller, chief computing officer at Calico Labs, said the singularity might not be as far off as 1,000 years, but agrees major advancements would need to be achieved before that point is reached. Currently, she elaborated, achievements in AI rely on very large data sets. For example, while a child can learn the word "dog" after being shown the animal three or four times, an AI system may require thousands of examples to recognize a specific animal.

"We need to have a machine learning paradigm that is able to learn from a small number of examples and also to transfer learning from domain to domain," she said. "Both of these are very nascent."

INTELLIGENCE VS. CONSCIOUSNESS

Another panel directly addressed the notion of consciousness, particularly the difference between consciousness and intelligence.

David Chalmers, co-director of NYU's Center for Mind, Brain, and Consciousness, described intelligence as "sophisticated, goal-directed behavior." In addition, intelligence can be measured externally, such as one's ability to play chess or navigate a new city.

Consciousness, on the other hand, is more difficult to define, but is commonly considered a subjective experience from the first-person point of view, or a stream of emotion and thought.

With regard to the question of whether machines can be intelligent, Chalmers said AI developers have been working on this a lot as they aim to leap from narrow to general AI that can achieve a number of goals. The notion of whether machines can be conscious, he said, is a very different question for which the answer is "no" among many experts.

Susan Schneider, a philosopher with the cognitive science program at the University of Connecticut, is writing a book called *Future Minds* in which she takes a practical, "wait-and-see approach" to the notion of machine consciousness.

The quest to recreate consciousness is a way of investigating whether it transcends the brain, Schneider said.

"Evolution did the first wave of mind creation," she said. "Businesses like Google and Facebook may be doing the second. So, we should get involved. We don't just want to leave it to economic interests."

Many scientists are racing to "hack the human brain" and to uncover the mysteries of consciousness for reasons including and reaching far beyond AI. But, according to Koller, comparing AI to human intelligence may prove to be a false dichotomy.

"There is no reason to believe the fastest path to machine intelligence is replicating the path evolution led us on in terms of creating natural intelligence," she said. "The obvious analogy is flight. Airplanes work nothing like birds. All of the attempts to replicate flight that is birdlike have failed."

ETHICAL CONSIDERATIONS

Even at its current state, AI is yielding ethical and policy concerns among myriad groups, from civil rights advocates and philosophers to lawmakers and small business owners.

Jeff Chow, vice president of product, consumer experience at TripAdvisor, said it's important to recognize and work through bias to ensure AI tools represent the population at large. For example, facial recognition has proven to work best on lighter skinned faces while voice recognition is more in tune with deep voices—a reflection of mostly white, male developers.

Finale Doshi-Velez, an assistant professor of computer science at Harvard University, pointed to the unintended consequences of skewed data sets. For instance, if a hospital has a lot of data on a certain class of people that frequent the facility, its AI may only yield results on how to treat that class of patients.



PHOTO BY KRISTIN QUINN

From left to right, Daphne Koller of Calico Labs, Adam Cheyer of Viv Labs, Nell Watson of Singularity University, and Loic Le Meur of Leade.rs participate in a SXSW discussion on "Exploring Innovations in AI."

She said some of the most popular verticals for AI, including healthcare, banking, and insurance, present many ethical questions.

As a broad but important example, how should health-care providers make decisions about people's health with a machine? Which decisions should be tasked to machines in the first place?

"There are a set of human values that we as a society have to decide on," Doshi-Velez said. "And those values could include an individual level of choice."

An example of individual choice could be determining how one's autonomous vehicle will or won't react in certain situations.

In insurance, actuaries are already using AI to make decisions that impact lives. Financial institutions are increasingly applying algorithms to assess loan risk.

"We need to gather data about how our values are being met or not met by whatever technologies or tools we have," Doshi-Velez said. "...This is not something that's happening in the future. It's happening now. Data is affecting our lives very easily, and millions of people are impacted by the decisions of software."

She emphasized that AI value systems should be decided upon by society "and not the engineer trying to make a decision by 5 p.m."

Chris Jones, vice president of technology at iRobot, warned that it's important to consider application specifics when making such determinations.

"[Regulating AI] is a very generic term," Jones said. "If you want to talk about regulating AI and its use in automobiles... it's going to be a very different conversation than regulating for healthcare. I've seen some of the comments being so generic in nature and so far-ranging that it's not actionable."

Nell Watson, an AI and robotics faculty member at Singularity University, which aims to prepare global leaders and organizations for the future, said there is an emerging discipline called machine ethics, which incorporates philosophy, logic, math, psychology, and social science.

"It's about the art and the engineering of loading values into the machines or helping machines make decisions that are more in line with our hopes and expectations, and, ideally, human flourishing," said Watson, who is also co-founder of a group called EthicsNet, which aims to create a dataset to teach machines to act in a socialized manner.

AI AND THE FUTURE OF WORK

Another major area of AI-related ethical and policy concern is the future of work. One panel highlighted the "disconnect" between Washington, D.C., and AI technology.

Terah Lyons is executive director of the Partnership on AI, which studies and forms best practices on AI technologies and works to advance public understanding of the technology. She also worked on AI issues for the White House Office of Science and Technology Policy during the Obama administration.

"It's become incredibly clear that AI will have outsized impacts potentially on communities that currently are not represented in the technology to the extent that they should be, and that the diversity and inclusion aspect is a real problem," Lyons said.

Rep. Terri Sewell, a Democrat from Alabama, agreed and voiced concern for the technologically underserved. Sewell, a proponent of the Future of AI Act and the AI Jobs Act, said

AI is not a high-ranking issue among her colleagues, and expressed concern that the digital divide is already vast in rural areas.

"I have parts of my district that still have dial-up [internet]," the Congresswoman said. "So rolling out broadband as part of an infrastructure strategy [is] huge. ...It is imperative that we focus more on the future of work and all of these great innovations and technologies that are coming our way. ...No one wants to slow down innovation. But huge swaths of my district are already behind, I can only imagine they will get further behind."

Sarah Holland with Google's Washington, D.C.-based public policy team, said all stakeholders—policymakers, academia, everyday citizens, and advocates—need to weigh in to determine how AI is going to land in society, from the economic impacts to the social.

"The convening power of government should be highlighted," Holland said. "And finding ways to help educate people that this is coming, and it's coming fast, and finding ways we can help it work for them."

Holland and Lyons both pointed to the power of open data to help level the AI playing field.

"AI is very asymmetric. Some companies are way ahead," Lyons said. "Open data is a way the government can lean in hard and help equip smaller organizations with the data and tools necessary to train models the way they might need to compete. Facilitating multi-sector conversations is critical to that because without crosscutting discussion it is far more likely that large tech companies are less tuned into the needs of citizens more generally."

REWRITING THE SOCIAL CONTRACT

According to Husain, there are two schools of thought with regard to AI and the future of work: the first—AI will take away nearly all human jobs; and the second—AI won't be able to perform most human jobs and instead the nature of work will evolve. For example, when society transitioned from agrarian to industrial, new jobs emerged that hadn't even been conceived of yet. But, Husain said, he sees many problems with the second camp's thinking.

"When the Industrial Revolution hit, what we had replicated was the human muscle. ...After that, the input of the human muscle in almost every economic endeavor diminished," he said. "Today, what we are talking about is replicating, if not all of the generality of the power of the human mind, enough of the capabilities that would allow economic endeavors across a broad array of activities to be carried out by these replicated machine minds. And if that's the case what else do we have? We are mind and machine."

Husain emphasized the need for policymakers to avoid comforting platitudes.

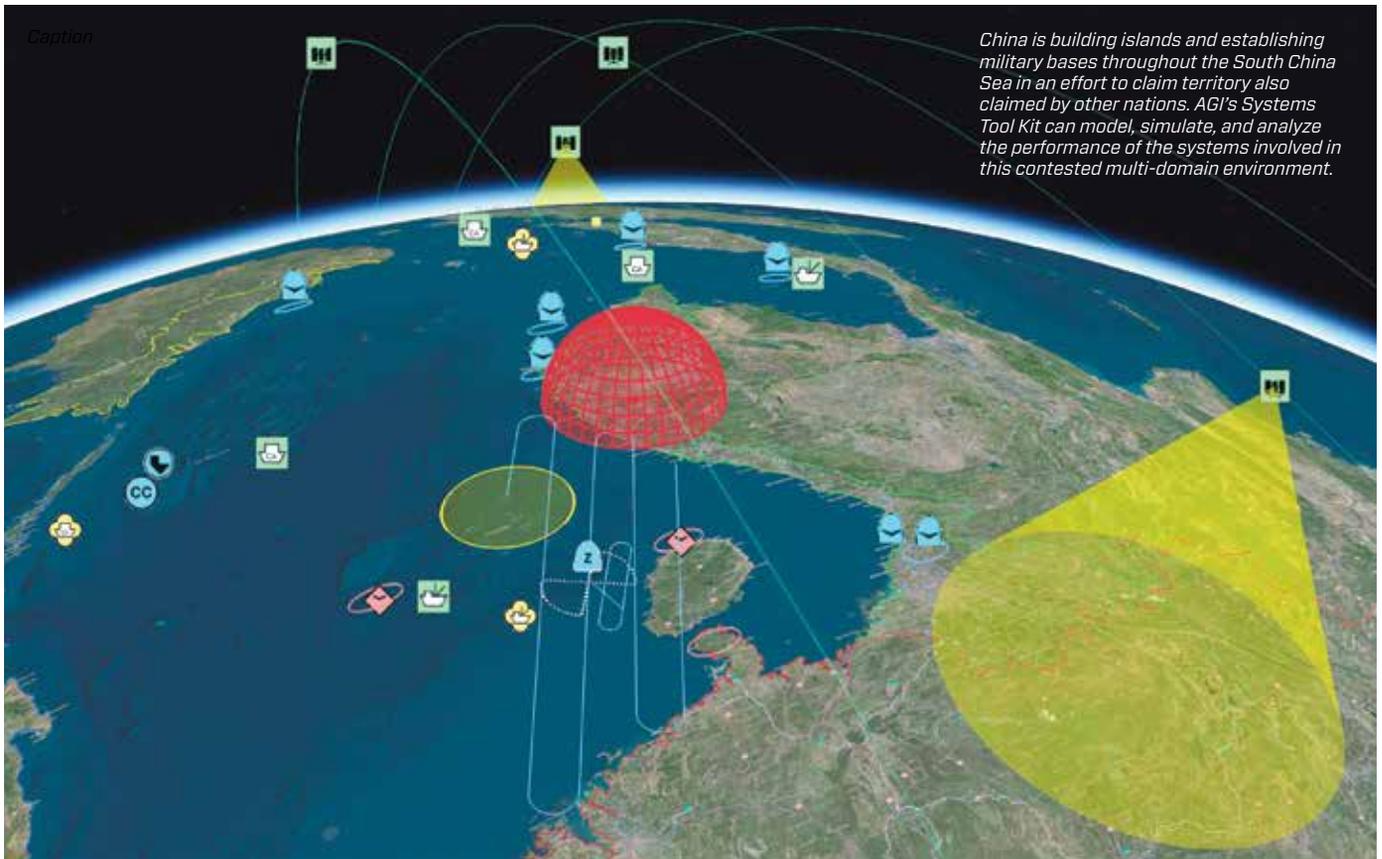
"The point is, [will] machines just on the current trajectory without AGI ... create a society with 50-70 percent unemployment unless we redo the social contract?" he said. "You're losing time to have a proper discourse around how the social contract needs to change."

Price said there's room to both manage AI responsibly as well as to take advantage of its potential to help solve global problems such as disease and climate change.

"We have to be responsible with AI," he concluded. "That said, I think it's the greatest opportunity in the world." 🌐

"It will be a paradigm more important than web and mobile and at a scale where every connected human and business will be transformed—and we're this close."

— ADAM CHEYER, VIV LABS



AGI: The Need for Speed

Q&A with Dave Peters, director, Intelligence Community Business Development

Q What is AGI's role in the GEOINT Community?

AGI is a commercial-off-the-shelf (COTS) software company serving both industry and government. We provide game-changing tools that model, analyze, and visualize objects in space and time with unprecedented accuracy.

STK, or Systems Tool Kit, is our core product. It's a desktop app for modeling and analyzing satellite and aircraft systems. We save our customers time by providing quick answers to questions like, "Where are my assets over time?" or "What targets are visible to my sensors?"

We also offer our Space Situational Awareness suite, which provides tools like quick maneuver detection to provide a picture of what you do and don't need to worry about in space. We also provide all STK algorithms in a development environment called STK Components.

Q How do you keep pace with the constantly changing face of intelligence?

We release new versions of our software multiple times a year and constantly add new functionalities based primarily on user feedback. We listen closely to the difficulties expressed by our users to make sure our software addresses emerging challenges. We also have tremendous subject matter experts sitting beside our software developers to make sure we're pushing new technology, new phenomenology, new ways to model systems, and new systems themselves.

Q What advice do you have for companies seeking to transform their data management and security practice?

Securing data is of course a first-level priority, but making it sharable is

imperative, and makes the data so much more valuable to our community and our customers who need data to feed STK. Hopefully new multi-level security and identity management solutions will allow the right data to get to the right users securely.

Q How is open-source data important to national security?

There are lots of great new capabilities being presented through open-source projects. But programs need to be sure they're not taking open-source code and creating their own stovepipe version of an application, which is ultimately going to raise maintenance costs. Even so, the opportunity for open source to rapidly propel missions is fantastic.

Our open-source product, Cesium, provides a time-dynamic globe in a

web browser. A lot of programs use it as a replacement to Google Earth Enterprise. Users in the IC, DoD, and industry often use Cesium in ways we didn't even think about until we saw it at a conference. That's the beauty of open source.

Q What differentiates AGI software from competitors?

Our software is ready to use immediately, as opposed to software development efforts that often fall behind schedule or run over budget. Additionally, keeping up with community needs means adding new functionality all the time. We help anyone involved with space systems, manned and unmanned aerial systems, and ballistic systems. Our users are able to monitor many different types of sensors—onboard systems, tracking sensors, GEOINT/SIGINT, and more. Having the breadth of capabilities we offer out of the box saves our customers time and money, and that's a big differentiator.

Q What emerging trends is AGI most excited about?

We see increasing complexity in GEOINT. It's multi-domain, and mixed between government and commercial. That's exciting, but creates a need for system orchestration along the lines of all the capabilities previously mentioned. Problems are getting harder, people need analytical results faster, and legacy tools and methods used in the past will be hard to use in this new, rapidly changing environment.

Q How have you personally benefited from USGIF membership?

USGIF membership has given me tremendous opportunities to advance my career. Attending large events like the GEOINT Symposium and smaller gatherings like GEOINTeraction Tuesday has helped expand my understanding of the many aspects of GEOINT, get a chance to speak with and learn from leaders in our community, and helped expand my network, all of which makes me better at my job and increases the value of AGI's contributions to the community.

ManTech: Securing the Future

Q&A with Damian DiPippa, senior vice president and general manager, Mission and Intelligence Solutions Business Unit

Q What products and services does ManTech offer?

ManTech offers a wide variety of solutions to the intelligence, defense, and federal civilian communities based on our core capabilities in cyber, data collection and analytics, enterprise IT, and systems and software engineering. For example, our work at the National Geospatial-Intelligence Agency is primarily focused on cybersecurity and network and IT service management. We have key qualifications for other Intelligence Community customers in areas like DevOps, cloud migration, and intelligence analysis and operations. We serve multiple intelligence agencies—CIA, NRO, DIA, NSA—as well as DoD and military intelligence programs.

Q Given ManTech's history of federal contracting, do you have any advice for partnering effectively with government agencies?

ManTech is proudly celebrating its 50th anniversary this year. Our goal is to be the trusted advisor to federal government customers in offering and implementing solutions and executing and enhancing their specific missions. We've had that from day one. Understanding and delivering on customer missions has been part of our culture for the last five decades, and it has led to ManTech's success.

We communicate clearly and frequently with customers and we find ways to rapidly integrate state-of-the-market technology to support their unique missions. That's the level of involvement and mission focus required for any company wanting a long-term position in the federal space.

“We made a concerted effort a long time ago to build and acquire the capabilities to become a leader in cybersecurity. We continue to invest in our people and technology to stay ahead of evolving threats.”

— DAMIAN DIPIPPA, MANTECH

Q How has ManTech evolved to keep pace with the explosion of geospatial data throughout the last decade?

Our cyber defense and insider threat teams work around the clock to ensure the security and integrity of NGA's data and networks. We made a concerted effort a long time ago to build and acquire the capabilities to become a leader in cybersecurity. We continue to invest in our people and technology to stay ahead of evolving threats.

Q What should federal agencies know about implementing successful cybersecurity initiatives?

I'll refer to the adage: “Once you build a better mousetrap, along comes a better mouse,” which sums up the current cybersecurity environment. Agencies can't let their guard down. Threats are constantly evolving, and they're growing more concerning every day. It's critical that we all stay abreast of technology and tradecraft standards to maintain security.

ManTech is focused on evolving ahead of those threats. One great example of this commitment is our Advanced Cyber Range Environment (ACRE). This provides a physical and virtual environment to test and model the security posture of an existing network against real-world threats—performed



Damian DiPippa

in a safe environment on a precise replication of that network. We offer this across security domain levels. We're also one of the top insider threat companies working with the federal government today.

Q How are AI and automation being integrated into ManTech's offerings?

Artificial intelligence and machine learning are natural evolutions of our software, DevOps, and analytic capabilities. Intel analysts deal in immense volumes of data and spend a considerable amount of time working to ascertain which portions of that data are most important. Our goal is to automate those routine and exploratory tasks and point the analyst to key changes or areas that require human analysis. We want to minimize the amount of data analysts have to touch so they can focus on the refined, actionable intelligence essential to making important decisions.

Q What differentiates ManTech from similar companies?

ManTech does so much more than just IT and data management. We recently changed our tagline to "securing the future." That's rooted in our DNA. Every single person in the company contributes to the safety, security, and protection of our nation, our warfighters, and our allies. Our 50-year history of dedication to customer missions and our understanding of how to implement new and emerging solutions—that's what really differentiates us.

Individual Member Spotlight: Aviation, GIS, and Continuous Learning

John Desmarais, director of operations, Civil Air Patrol

The first time John Desmarais got into the cockpit of an airplane, he was hooked. Desmarais joined the Civil Air Patrol (CAP) in 1987, and shortly thereafter began pursuing his undergraduate degree in aviation business and safety of flight at Embry-Riddle



This oblique aerial photo monitoring the status of Antonio Juarbe Pol Airport in Arecibo, Puerto Rico, was taken in September 2017 during Hurricane Maria response efforts.

PHOTO BY MAJ. DAYLE ROBINSON, CIVIL AIR PATROL

Aeronautical University. During his senior year, Desmarais landed a position with CAP's cadet programs office. He eventually moved to the operations side, and has been climbing the ladder ever since, including eight years spent as deputy director of operations, and six (so far) as director. In 1996, Desmarais founded the National Emergency Services Academy, which educates nearly 500 students each summer.

Q What is your advice for young GEOINT professionals?

Never stop learning. The technology we use day to day is constantly changing, and in many cases, amazingly, getting less expensive. CAP is a nonprofit, so we don't have millions of dollars to throw at problems, but we can cost-effectively take on new missions by paying attention to industry and staying abreast of new technology. People see you continuing your education and staying in tune with current trends, and that allows you to progress.

Q How does CAP employ geospatial data to support its numerous missions?

We do a lot of airborne imagery collection for state and local emergency management agencies and FEMA. We're not necessarily managing GIS

programs, but we're trying to provide commercial, off-the-shelf, easily importable imagery for folks to use for emergency response.

Q How important is open data sharing with regard to CAP's emergency response efforts alongside federal agencies?

Part of the reason CAP is successful is because we make our data so easily accessible. We don't want to be the keepers of imagery. We don't have tons of money to put into data storage and management. When you collect large-scale imagery and video, you're talking about huge volumes of data.

Years ago, we used to host imagery as part of our systems. We had a publicly viewable website, as well as secure sites for sensitive data. In the big picture, though, we weren't the best option for the maintenance of that imagery. We had to purge it quickly and couldn't maintain it long-term.

We worked with FEMA who now hosts all of our publicly available imagery as part of their



John Desmarais



GEOPlatform. We took close to half a million photos for hurricane season alone last year. All of it is hosted by FEMA. They even host our training imagery.

Q How important are civilian volunteers to your mission?
CAP is unique in that volunteers conduct the vast majority of our missions. We've only got about 150 paid staffers. There are lots of things volunteers could do in an increased capacity for agencies, and I think some agencies are starting to realize the significance of the

volunteer population.

Everybody has an iPhone or smart device with which they can collect

pretty good imagery of just about any event. For applications like emergency response, GIS workers are starting to look at whatever imagery is immediately available. Lots of organizations and government agencies are beginning to incorporate unconventional imagery when there is a starving need for it immediately after an incident. We've worked closely with FEMA on crowdsourcing capabilities employed during recent hurricane responses, which allows people to rate pictures and help us direct resources.

Q What excites you most about the future of GEOINT?
Accessibility. I've been in the industry a long time, and I've seen expensive sensor systems do great things. Now that costs have gone down and devices are smaller, they're a lot more accessible and easier to employ in new ways. We did an RFI a few years ago for aerial imagery sensors. Systems that cost millions of dollars per sensor then cost half a million dollars now, and prices keep dropping. There's an overwhelming need for these tools.

Q How has USGIF Membership helped your career development?
CAP was introduced to USGIF through NGA and FEMA. What helped me most is visibility into what everybody else in the industry is doing so we can do our due diligence to keep up. I'm not a GIS professional; I'm an aviation professional who uses GIS tools. It's helpful to see how all levels of government are acting because the landscape changes every day. USGIF has also allowed me to provide opportunities to some of my folks through training or long-term strategic planning. It's been a guide for how we should support our role in the community. 🌐

“USGIF has also allowed me to provide opportunities to some of my folks through training or long-term strategic planning.”

— JOHN DESMARAIS,
CIVIL AIR PATROL



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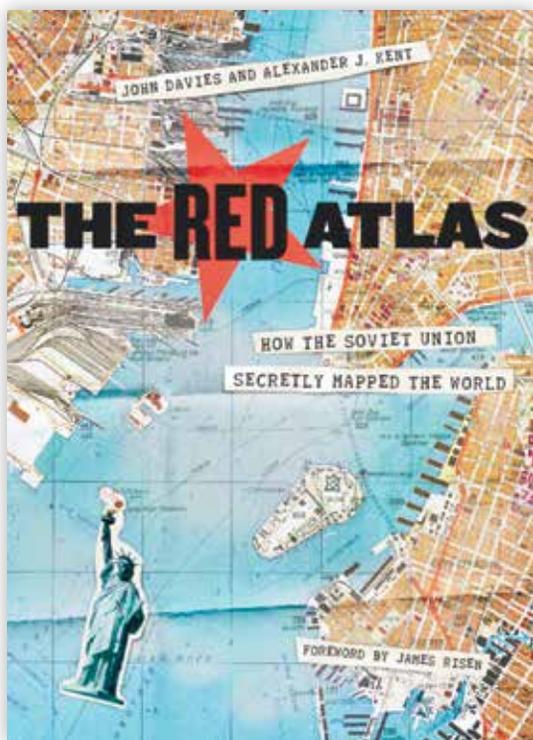
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READING LIST



The Red Atlas: How the Soviet Union Secretly Mapped the World

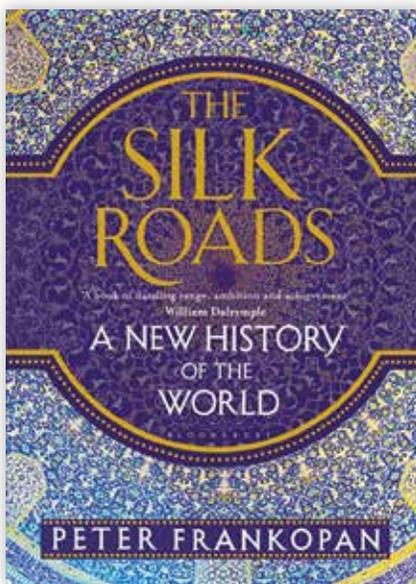
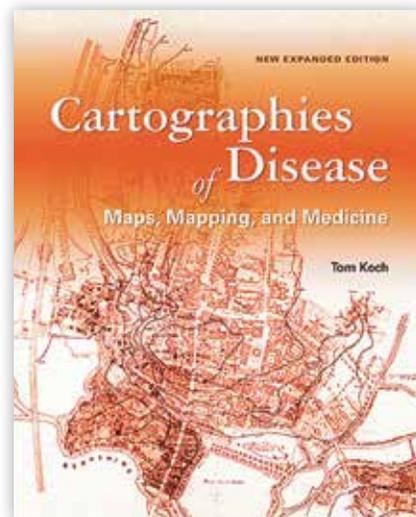
By John Davies and Alexander J. Kent

This book offers a view of the western world through the lens of the Soviet Union's secret spies, scouts, and surveyors. During the Cold War, the Soviet army launched the most comprehensive mapping mission of its time, piecing together intricately detailed, to-scale maps of the entire world using both early remote sensing technology and intelligence agents on the ground. The maps are astonishingly detailed and diverse, ranging from canal depths and bridge capacity to road widths and building heights.

Cartographies of Disease: Maps, Mapping, and Medicine

By Tom Koch

Esri Press presents a new, expanded edition of this book, which is an investigation of the relationships among populations, places, and medical maladies. Beginning with the plague maps of the 1600s, the book charts the history of spatial science's role in the fight against dangerous viruses and bacteria. The new edition features corrections and information updates, as well as new chapters on the 2014 Ebola epidemic and cartography's role in its containment.



The Silk Roads: A New History of the World

By Peter Frankopan

Frankopan's vision of history sets the Central Asian Silk Roads as the undeniable center of commerce, transportation, and geopolitics. This book examines the trade network's influence in the establishment and advancement of major cities in the Eastern hemisphere, and considers it as a conduit for goods, diseases, and troops. The scope of the author's investigation is wide, and peers over the horizon to assess how the future of major metropolitan areas rests on the well-being of the trade patterns established by the historic Silk Roads.

USGIF EVENTS CALENDAR

SEPTEMBER
11

GEOINteraction
Tuesday
Hosted by Vricon
McLean, Va.

SEPTEMBER
19-20

trajectoryXyzt
Sana Monica,
Calif.

SEPTEMBER
28-29

GeoAcademic
Summit
Herndon, Va.

OCTOBER
16-18

Tech
Showcase
West
St. Louis, Mo.

NOVEMBER
10-16

GEOINT
Community Week
Northern Virginia

NOVEMBER
17

GEOGala
McLean, Va.

Woolpert announced the hiring of **STEVE AMBROSE** as new program director of government solutions. Ambrose brings with him more than 40 years experience, including positions with NOAA and the National Weather Service.

After completing its acquisition of CRSA, General Dynamics established the leadership team at the revamped General Dynamics Information Technology branch. **AMY GILLILAND** remained president, **BERNIE GUERRY** was appointed COO, **ALISON HARBRECHT** was named CFO, **GEORGE BATSAKIS** was designated chief growth officer, and **KRISTIE GRINNELL** became CTO.

Dewberry promoted **WENDY KORITKO** to associate vice president in the firm's Fairfax, Va., office. In her former role of controller, Koritko led financial reporting, budgeting, and external audits.

Hexagon US Federal appointed **TAMMER OLIBAH** president and CEO. Olibah is a former IT and cyber executive at Booz Allen Hamilton with nearly 20 years of experience innovating in federal and commercial sectors.

STEPHANIE O'SULLIVAN was elected to Battelle's board of directors, where she'll support STEM research and education and serve on the organization's Science

and Technology and Community Benefit Committee. O'Sullivan has more than 30 years of experience, including roles at the Office of Naval Intelligence, CIA, and ODNI.

JOHN PEREIRA, intelligence industry leader for defense and intelligence at IBM Global Business Services, was named an intelligence community fellow at the IBM Center for The Business of Government. Pereira will direct thought leadership pertaining to intelligence in government.

The White House announced the nomination of **LISA PORTER**, In-Q-Tel's executive VP and the director of IQT Labs, to serve as deputy undersecretary for research and engineering at the Defense Department. Porter has significant experience in the federal space, including leadership positions with IARPA, DARPA, and NASA.

HawkEye 360 announced an expansion of its advisory board to include two new members: **THE HONORABLE ROBERT O. WORK**, who recently served as U.S. Deputy Secretary of Defense, and **LT. GEN. (RET.) JOHN F. MULHOLLAND JR.**, as well as the appointment of **LETITIA A. LONG** as chairperson.

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GEOINT AND THE ART OF THE POSSIBLE

Former DigitalGlobe CEO Jeff Tarr on the future of commercial remote sensing

Jeff Tarr is the former CEO of DigitalGlobe, where he served in that position from 2011 until the sale of the company to MDA to form Maxar Technologies in October 2017. Tarr is also a member of USGIF's Board of Directors.

Q You moderated a panel on the main stage at GEOINT 2018 on "The Future of Commercial Remote Sensing." What were some takeaways from that discussion?

First is the number of participants in the GEOINT industry. There are more than 30 companies operating Earth imaging satellites or that have announced intent to do so. And more than 100 companies are focused on helping customers make sense of data. The large number of players raises the question of who will ultimately be successful.

Second, panelists talked about the application of new technologies to make sense of the vast and growing volume of remote sensing data, including AI, the IoT, and augmented and virtual reality.

Third is the breadth of business models. Operators are pushing beyond collection into analysis. At the same time, a large number of players are emerging who neither own nor operate assets in space but are buying and analyzing data to serve specific verticals.

Finally, panelists spoke on the importance of GEOINT as a contributor to global issues. GEOINT is critical to addressing humanitarian challenges, ranging from combatting climate change to eradicating polio, to human trafficking, to protecting the food supply and ensuring access to clean water. For all of these, GEOINT promises to contribute substantially.

Q Even though geospatial intelligence has a role in worldwide industries and challenges, it is still not a common term outside the realm of national security. How do you suggest the community addresses this?

Our energies should be focused on solving customer problems, not on terminology. Remote sensing is characterized by a blurring of the lines between the digital and the physical as well as between once-distinct technologies. The term geospatial intelligence addresses that by encompassing a wide range of related technologies.

But while the term may be helpful, it's more important our



industry understands the convergence of these technologies, and our customers understand what GEOINT can do for them.

Q What can be done to help customers better understand the landscape?

USGIF plays an important educational role, whether it's through the GEOINT Symposium, *trajectory* magazine, or the new *trajectoryXyzt* event to be held in Santa Monica this September. Then there's the work USGIF is doing with universities to educate students and support research in these fields. Long ago, GEOINT's primary use cases were related to national security. We're far beyond that, which is one of the reasons I'm excited about the commercial-facing *trajectoryXyzt*. It's going to provide a forum for those who are interested in GEOINT and the art of the possible to come together.

Q Do you think the "killer app" for GEOINT has been discovered yet? If not, what do you predict it will be?

Yes, there are killer apps today. However, searching for one killer app may be the wrong way to look at it. One killer app is the map: driving directions, traffic insights. We use it every day, every time we try to find the quickest route home or discover a new local business. Every time we check the weather, we're using GEOINT. And yet another is precision agriculture.

Will there be others? Certainly. Autonomous vehicles will not be possible without GEOINT. I'm sure there are applications that have not yet

been imagined. I'm excited about applications that offer the potential to improve the state of the world. If you're going to eradicate polio, you need to know where people are that need vaccines. If you're going to ensure safe, clean water, you need to understand the state of water tables and distribution and drainage systems. GEOINT is a killer technology with a lot of amazing applications.

Q What does it take for a business in the GEOINT industry to be successful?

First, you have to know your market. It's important because you can do so many things with GEOINT.

Second, data quality matters. GEOINT is used to answer high-stakes questions such as those that keep nations safe and inform life-or-death decisions. The cost of high-quality data is usually less than the value of getting the answer right. If higher quality GEOINT is the difference between an autonomous vehicle getting safely from point A to point B, how much more are you willing to spend?

Third, understand the trade space. There are always tradeoffs in collecting and processing GEOINT. These decisions must be informed by a deep understanding of customer needs.

Finally, instill a sense of purpose in your workforce if you want to attract talent and build customer trust.

If you lose sight of any one of those key drivers, you will find yourself in trouble. It comes down to understanding the customer, delivering better value, delivering a return, and leading with purpose. 🌐

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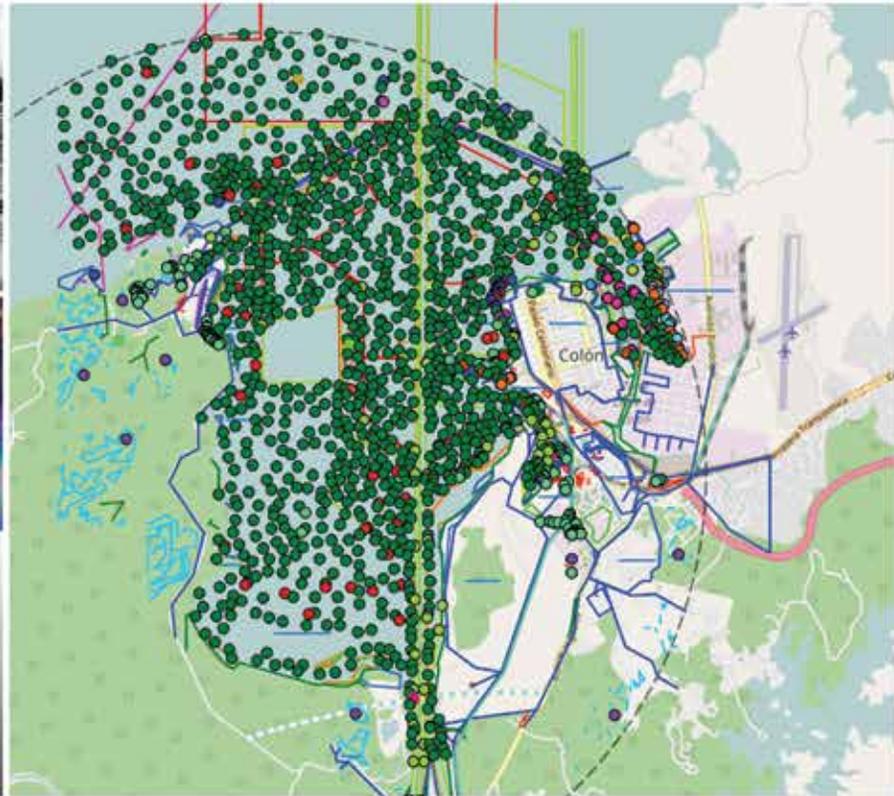
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