

# RESEARCH HIGHLIGHTS



Smithsonian  
Institution

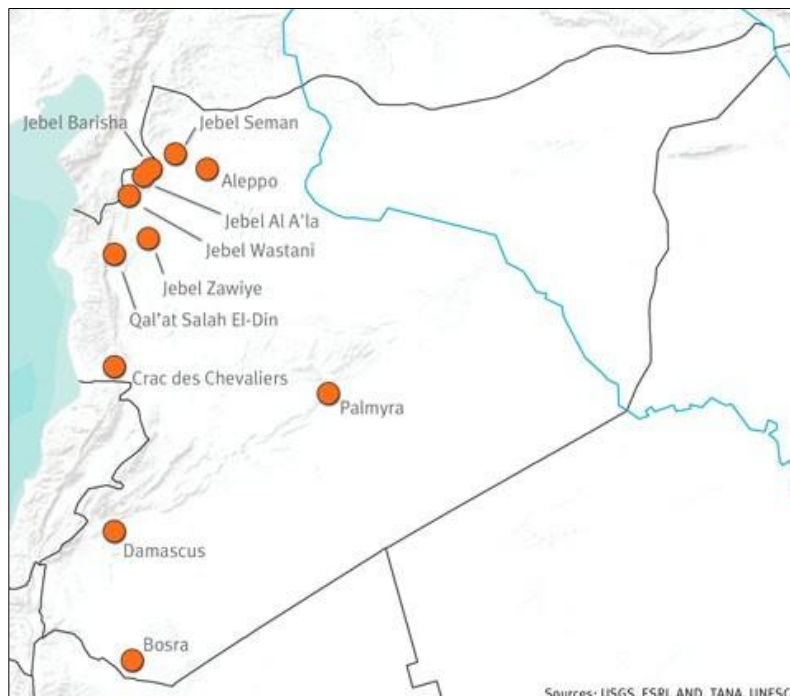
JANUARY 2016

## ANCIENT HISTORY/MODERN DESTRUCTION EXHIBITION

SMITHSONIAN PENN CULTURAL HERITAGE CENTER & AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

On December 10, 2015, colleagues from the **Smithsonian, Penn Cultural Heritage Center** at the University of Pennsylvania, and **American Association for the Advancement of Science (AAAS)** participated in a symposium and exhibit opening at the AAAS headquarters in Washington, D.C., which highlights cutting-edge scientific methods, new technologies, and current research projects that are underway to reveal and understand the cultural tragedy of deliberate heritage destruction in Iraq and Syria. Cultural heritage is the physical manifestation of a people's history and forms an important part of their identity. Deliberate heritage destruction, which attempts to remove all traces of the past, is often used as a tool of ethnic and sectarian violence. Unfortunately, this type of damage is an ongoing part of the conflict in Syria, Iraq, and elsewhere across the globe. In addition, archaeological site looting during periods of social and political unrest causes extensive damage to ancient centers.

The Smithsonian, with partner organizations, has trained Syrians (in Turkey) and Iraqis to protect heritage in place and is monitoring cultural destruction and looting through satellite imagery, social media, and other reports. The Smithsonian is also working on longer-term projects using scientific methods and technological tools to document, investigate, and ultimately understand heritage loss in order to develop preventative measures and create more effective humanitarian and policy responses.



Only one of Syria's six World Heritage sites, the Ancient City of Damascus, appears to remain undamaged in satellite imagery since the onset of civil war in 2011.

## SMITHSONIAN-CORNELL PARTNERSHIP PRODUCES FIRST PUPPIES FROM IN VITRO FERTILIZATION SMITHSONIAN CONSERVATION BIOLOGY INSTITUTE

**Smithsonian Conservation Biology Institute** (SCBI) scientists and researchers at Cornell University have become the first to successfully use in vitro fertilization to produce live, healthy domestic puppies from cryopreserved (frozen) embryos. **The Cornell-Smithsonian Joint Graduate Training Program**, which published its results on December 9th in PLOS ONE, merged Cornell's Dr. Alex Travis' knowledge of sperm physiology and SCBI's Dr. Nucharin Songsasen's expertise in oocyte (egg) biology to make significant headway in this field of research.

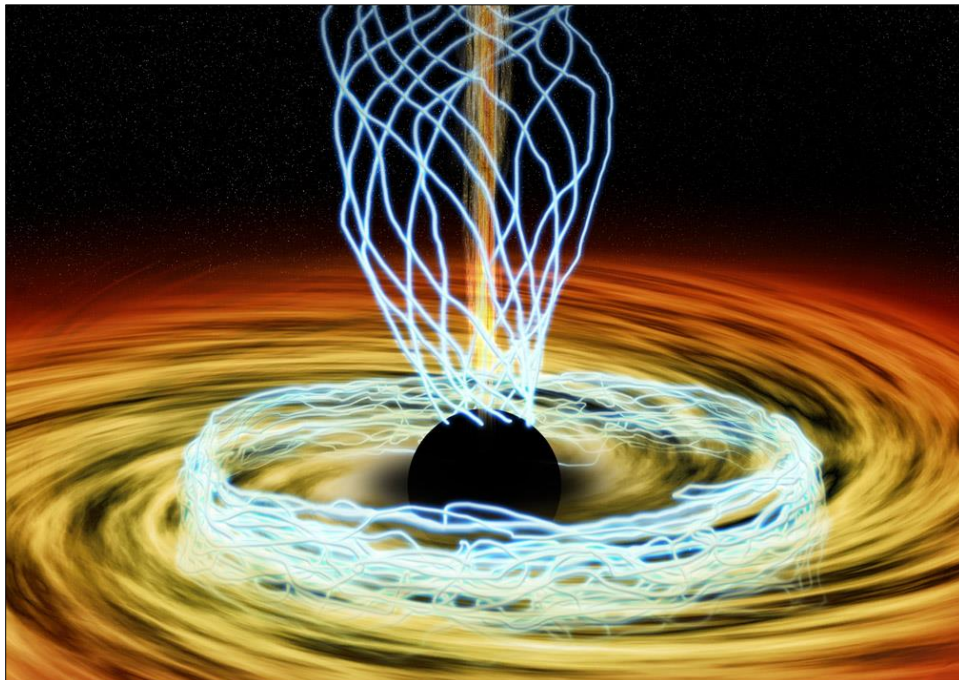
The achievement holds promise for gene editing of dogs to eradicate certain diseases and disorders. The litter also signals promising conservation implications for endangered species. SCBI collects and freezes ovarian tissue and sperm when genetically valuable individuals die. This research is one step closer to applying in vitro technologies to endangered canids (such as maned wolves), which may help to ensure their survival while their populations continue to decline in the wild. For the in vitro pups, the process involved transferring 19 embryos to a host female dog. The host gave birth to seven healthy puppies, two from a beagle mother and a cocker spaniel father, and five from two pairings of beagle fathers and mothers.



## EVENT HORIZON TELESCOPE REVEALS MAGNETIC FIELDS AT MILKY WAY'S CENTRAL BLACK HOLE

SMITHSONIAN ASTROPHYSICAL OBSERVATORY CENTER FOR ASTROPHYSICS

Most people think of black holes as giant vacuum cleaners sucking in everything that gets too close. However, the supermassive black holes at the centers of galaxies are more like cosmic engines, which convert energy from in-falling matter into intense radiation that can outshine the combined light from all surrounding stars. When the black hole is spinning, it can generate strong jets that blast across thousands of light-years and shape entire galaxies. These black hole engines are thought to be powered by magnetic fields. For the first time, astronomers have detected magnetic fields just outside the event horizon of the black hole at the center of our Milky Way galaxy. Magnetic fields have been predicted to exist, but not proven. "Our data puts decades of theoretical work on solid observational ground," said principal investigator Shep Doeleman from the **Smithsonian Astrophysical Observatory Center for Astrophysics**. The results appear in the December 4th issue of the journal *Science* and was achieved using the **Event Horizon Telescope (EHT)** — a global network of radio telescopes that link together to function as one giant telescope the size of Earth. Since larger telescopes can provide greater detail, the EHT ultimately will resolve features as small as 15 micro-arcseconds. (An arcsecond is 1/3600 of a degree, and 15 micro-arcseconds is the angular equivalent of seeing a golf ball on the moon.) Such resolution is needed because a black hole is the most compact object in the universe. The Milky Way's central black hole, Sgr A\* (Sagittarius A-star), weighs about 4 million times as much as our Sun, yet its event horizon spans only 8 million miles — smaller than the orbit of Mercury. Since its located 25,000 light-years away, the size corresponds to an incredibly small 10 micro-arcseconds across. Fortunately, the intense gravity of the black hole warps light and magnifies the event horizon so that it appears larger on the sky - about 50 micro-arcseconds, a region that the EHT can easily resolve.





## FUNDING FOR CITIZEN SCIENTIST PROGRAM

### ANACOSTIA COMMUNITY MUSEUM

The **Anacostia Community Museum** received \$54,000 in second-round funding from the State Farm Youth Advisory Board (YAB) during the 2016 project period to support expansion of its **Citizens Scientist Program (CSP)** Urban Ecology Engagement Initiative, in partnership with the **Smithsonian Environmental Research Center**. The State Farm grant will facilitate the involvement of youth from additional schools in the metropolitan area, including Montgomery County, Maryland.

The Citizen Scientist Program is an extension of the museum's multi-year, multidisciplinary Urban Waterways Project, and has engaged more than 200 local middle and high school students since 2013 to collect environmental data and conduct scientific research to improve understanding of the biology and water quality of the Anacostia River Watershed. Participants conduct experiments and analyze data to ascertain the environmental health of the largely polluted local streams and waterways in their communities.

The Anacostia Community Museum is one of 62 organizations to be awarded the YAB service-learning, youth-led grant nationally and is among the 22 selected in their eastern market area for the school year. "It is a testament to the important work our youth are doing that State Farm has provided this second and more generous gift," said Sharon Reinckens, the museum's deputy director. "We are particularly proud that almost 98 percent of the CSP students who graduated last year were college bound and a third were engineering or STEM majors. All of the program participants described their CSP experience as life changing in their college applications, and this is just the kind of impact we want to have."



## FUNDING SUPPORTS RESEARCH ON DIGITIZED MUSEUM RESOURCES FOR K–12 EDUCATION

SMITHSONIAN CENTER FOR LEARNING AND DIGITAL ACCESS

The **Smithsonian Center for Learning and Digital Access** was awarded a \$500,000 grant from the Carnegie Corporation of New York to fund a two-year research project. Findings from the study will be used to enhance the **Smithsonian Learning Lab**, which is launching in public beta this fall, and to advance digital teaching and learning strategies throughout the education field. The Smithsonian Learning Lab is designed for learners of all ages, and serves as an engaging digital destination for the discovery, creation, and sharing of new ideas and knowledge, supporting the development of critical and lifelong skills.

The two-year research project will be conducted in partnership with Mark Warschauer, professor of education and informatics and interim dean of the School of Education at the University of California, Irvine, and participating classroom teachers. The project will analyze teacher and student use of more than one million digital learning assets and tools from the Smithsonian’s collections available through the Learning Lab. The research project will also address and build on the findings of previous studies to ensure that educators effectively find and use the digital resources that cultural institutions are increasingly making available and have the potential to improve student outcomes. The major focus of the work will be on how K–12 teachers and students use the Learning Lab, comparing those who receive professional development and mentoring at pilot sites and those who access the material independently online.

