

Mother Africa's Journal

A National Geographic Exploration Grant Proposal
by Elizabeth Leake, STEM-Trek Nonprofit





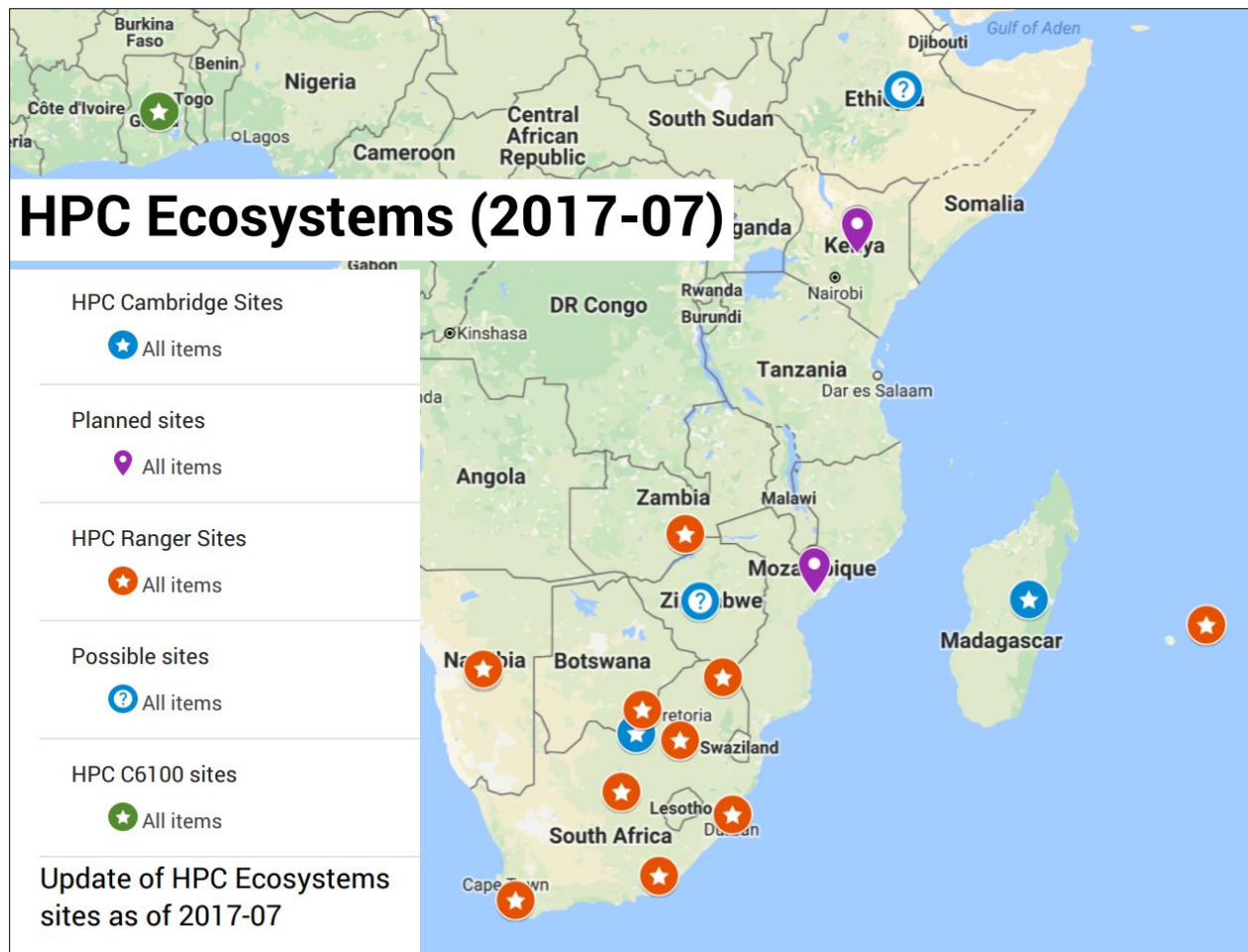
Mother Africa's Journal

By Elizabeth Leake ([STEM-Trek Nonprofit](#))

As a storyteller, I've chronicled research computing and data science progress in sub-Saharan Africa since 2012. My articles are featured in high-tech journals, STEM-Trek social media platforms and government reports. I also plan and facilitate advanced skills training programs. The above photo represents a November, 2017 cohort from a dozen countries who participated in the "Understanding Risk in Shared CyberEcosystems, or URISC@SC17" cybersecurity workshop. The program was supported by the U.S. National Science Foundation, Google and Micron Foundation.

Supercomputers, or high performance computing (HPC) systems, are expensive and only viable in high-production environments for about five years before they're decommissioned; that's the duration of most warranties. Government grant-funded cycles mirror the hardware shelf-life. Unfortunately, in many cases, the people who support supercomputers are only supported for five years, including grant-funded outreach, education and communications personnel. Many find themselves "decommissioned" after five years, and must find work with another project. Unfortunately, many are at risk of falling out of the HPC workforce pipeline with each transition. This practice doesn't support relationship continuity, or long-term specialization in a complex and ever-changing field. It's an unfortunate situation that I've tried to address via the nonprofit organization I founded in 2012 called STEM-Trek.

STEM-Trek is a global, grassroots public charity that supports high-tech workforce development for scholars from underserved regions. We foster a sustained community of practice where professionals who work on short-term, grant-funded tech projects can find long-term psycho-social support, mentors, collaborators and scholarly travel opportunities. The articles I write focus on the people who support and use the technology that accelerates the process of scientific discovery. Our workshops feature themes, such as food security science, cybersecurity and blockchain for social good. Workshop participants not only learn about technology, they meet people from other countries who work in comparable roles with similar challenges. In this regard, STEM-Trek promotes science diplomacy, and international research collaborations.



HPC Ecosystems Project, Image from CHPC South Africa.

The African HPC Ecosystems Project (map above) is led by the [South African Centre for HPC](#) in Cape Town, and utilizes supercomputers that were decommissioned from U.S. and European programs. Large systems are split into smaller ones, refurbished with new switches and continue to live a second life in 15 sub-Saharan locations. The project covers much of the Southern African Development Community (SADC) region, and has extended to Ghana and Ethiopia.



HPC Ecosystems group visited the Texas Advanced Computing Center in 2015.
Photo by Elizabeth Leake, STEM-Trek Nonprofit

Each Ecosystems center is supported by tech generalists who maintain the hardware, install and upgrade software and teach others how to use it. Unfortunately, most wear so many hats that there isn't time at the end of their day to plan for the future. Since the hardware is older, it won't last forever; it's therefore urgent that they begin to frame a case for greater

legislative and public support for the future. While newer hardware will be available as more systems are decommissioned by collaborating agencies, it's important that each center build a local case for growth: establish advanced skills training programs, promote peer-reviewed and published science and engineering highlights and foster institutional and government buy-in. Without such support, it will become increasingly difficult to justify energy and facilities costs. Once senior leadership are disappointed in a program they don't understand, it is unlikely they will support new endeavors in the future.

High-level decision-makers have their hands full, and HPC is a tough sell since it's so expensive (costly in terms of personnel, space and energy)! National leaders are presented with urgent and competing priorities for public funds on a daily basis. South Africa and Botswana, for example, are experiencing a terrible drought; [Cape Town](#) may exhaust its supply of fresh water in 2018. This situation has forced usual priorities to be sacrificed in favor of urgently-needed infrastructure that will deliver fresh water for human and livestock consumption.



Boulders Bay, South Africa. Photo by Elizabeth Leake, STEM-Trek Nonprofit



Communicators who support each center would benefit from having access to more photographs of Africa’s unique biodiversity, people and places. They should be coached in the art of communications; specifically, how to translate “geek-speak” into meaningful stories that the average pan-African taxpayer can relate to.

How will HPC deliver fresh water or prevent the spread of infectious diseases, for example? How can big data protect human rights and promote peace? What’s the relationship between education and public health? Answers to these questions, and more, will be expressed in the form of science and engineering highlights that are written so that average people will understand why a high-tech investment is justified.

Because it is estimated that there are more than one thousand languages spoken on the African continent, content will be brief, easily understood by a fourth-grade level of comprehension and visually appealing—each picture must tell a thousand words. The stories can then be included in the arsenal of strategies used by pan-African decision-makers who seek international support to mitigate global challenges that are deeply rooted in Africa. We must illuminate the humanity and environment that is at risk; the very people and places science and engineering discoveries can protect.

Africa is the cradle of humanity; the metaphorical mother of civilization. While women generally comprise half of the population, they struggle to achieve parity in the pan-African workforce. STEM careers are no exception. STEM-Trek workshops encourage applications from women, and we’ve seen the number double with each event as the pipeline fills with female prospects. Because of the important role women play in Africa’s future, we will call our collection of stories “*Mother Africa’s Journal.*”



Unlike most science and engineering highlights that showcase a specific nation, grant, institution, practitioner or research team, our stories will represent Africa’s biodiversity, climate and geography. They will be made available for free to HPC Ecosystems stakeholders. We will develop a template that communicators can use when preparing content for submission to *Mother Africa’s Journal.*



The Fisherman. Photo by Doug Falter, Doug Falter Photography

One of the most confounding challenges—rather a confluence of factors that science has yet to fully understand— is climate disruption, and how it impacts agriculture, aquaculture and public health. Islands are affected more than other regions since their geography is static and island-dwellers can't migrate to avoid desertification or flooding; you might say they're the canaries in the climate change coal mine. Each season they experience progressively more violent typhoons, cyclones and hurricanes while sea levels and water temperatures are rising. Pests, diseases and fish are suddenly behaving in different ways. Because fewer can grow what they consume, more is imported, and at a higher cost.

Because agriculture and aquaculture once comprised a large portion of island nations' gross domestic products (GDP), such challenges must be a priority, but public funds are usually needed for more urgent things, for example, repairing storm-damaged infrastructure. Tourism and commerce are viable ways to invigorate GDPs, but poor infrastructure is seldom attractive to businesses or tourists. A quick financial gain can be made from allowing energy companies to drill offshore, but that is likely to have a profoundly detrimental impact on the environment and tourism. Drilling has already occurred near Madagascar, Comoros and Seychelles.

There are now four island nations in the SADC region, including Madagascar, Comoros, Seychelles, and Mauritius. This project will focus on projects led by scientists and engineers from Botswana, Madagascar, Mauritius, Seychelles and South Africa. We will record progress made by research that uses computational and data resources managed by HPC Ecosystems project stakeholders, and *Lengau* (the fastest HPC system on the African continent located in Cape Town, South Africa). Emphasis will be given to challenges faced by island dwellers, and we hope to record a snapshot of conditions in 2018—a high-level written and visual account of the geography, climate and biodiversity (land and water); as well as the environmental and socioeconomic conditions of island dwellers—with the hopes of returning in three to five years to document change.

This proposal requests financial support for an activity that would take place in Botswana, Madagascar, Seychelles, Mauritius, and South Africa between October 28 and December 10, 2018. Over a total of 43 days, the project team will meet with volunteer scientists and engineers to identify additional stakeholders; visit five of the 15 sites that participate in the pan-African HPC Ecosystems Project and chronicle research being conducted on behalf of Mother Africa.



Photo by Doug Falter, Doug Falter Photography

Photos, videos and multimedia content developed from this experience will be available for sale or free stakeholder use with the photographer's written permission; contact [STEM-Trek Nonprofit](#) and/or Photographer [Doug Falter](#).

Project Team



**Elizabeth Leake, Principal Investigator
STEM-Trek Nonprofit**

Elizabeth Leake is a storyteller, consultant, correspondent and advocate who serves the global high performance computing (HPC) and data science industries. In 2012, she founded STEM-Trek, a global, grassroots nonprofit organization that supports workforce development opportunities for science, technology, engineering and mathematics (STEM) scholars from underserved regions and underrepresented groups. As a conference blogger and communicator, her work drew recognition when STEM-Trek received the 2016 and 2017 *HPCwire* Editors' Choice Awards for Workforce Diversity Leadership. Before STEM-Trek, Leake worked for public universities in communications, outreach, research computing support and technology administration roles for 20 years before joining the U.S. National Science Foundation's TeraGrid project based at Argonne National Laboratory. TeraGrid was the world's first federated HPC project, and as its first external relations coordinator, Leake led a nationally-distributed team of 18 science writers and outreach professionals. As the project's interagency and international liaison, she facilitated conference planning committees and served as a U.S. correspondent for events hosted by the European Grid Infrastructure (EGEE/EGI), and the Partnership for Advanced Computing in Europe (DEISA/PRACE). Volunteer work led Leake to South Africa in 2012, and she continues to support cyberinfrastructure and human capital development projects led by the South African Center for HPC, and others with a footprint in 18 sub-Saharan nations.



Doug Falter, Photographer

Doug Falter excels at capturing the beauty and vitality of the ocean using the elements of light, color and his unique perspective as a surfer. Nationally and internationally recognized for his stunning photographs, Falter did not discover his deep passion for the ocean until his early adult life. At the age of 21, he was working at a nine-to-five job for a large corporation. Seeking relief and solace from the daily grind, he took up surfing as a hobby, and was immediately captivated and entranced by the beauty of the ocean. Inspired by his newfound passion for surfing and waves, Falter set out to capture their shared essence through photography. His pursuit of ocean waves led him to Hawaii—the birthplace of surfing—while visiting the islands he decided it was time to make a change. In a leap of faith, he left his job, parted with all of his possessions, and embarked on a path in pursuit of his true passion. Equipped with only a backpack, laptop, and minimal camera equipment, he set off to the North Shore of Oahu, Hawaii. Committed to encountering the ocean at a deeper level, he studied its nature and began swimming into waves larger than most would dare approach. Within his first year of shooting, his work attracted national and international attention and critical acclaim, including recognition from numerous magazines and media outlets. His powerful, exquisite shots have been featured in magazines widely circulated in Brazil, Australia, Peru, South Africa, the U.S. and Japan. Today Falter serves as a featured contributing photographer for TheInertia.com, and has been a National Geographic Editor's Pick. His work is also popular on social media, attracting more than 20,000 Facebook fans and 10,200 Instagram followers.

International advisers and local guides (more science advisers will be added):

Botswana:

Tsaone Swaabow Thapeloo (Botswana Institute for Technology Research and Innovation)

Madagascar:

Andry Ratsimandresy (Canadian Fisheries and Oceans). Dr. Ratsimandresy is an oceanographer who is originally from Madagascar. He will serve as a local guide and introduce us to people we should meet and places to visit while collecting content for Mother Africa's Journal.

Mauritius:

Selvyn Ramasawmy (University of Mauritius). Mr. Ramasawmy will serve as a local guide, and he is active with the HPC Ecosystems Project.

Seychelles:

INVITED: Kevin Fabien (National Institute for Science, Technology, and Innovation). Victoria, Mahe (Seychelles). Mr. Fabien will serve as a local guide. He is involved with the HPC Ecosystems Project and is an electrical engineer.

South Africa:

Mary-Jane Bopape, Scientific Adviser; Chief Scientist at the South African Weather Service
Bryan Johnston (Training Coordinator, South African Centre for HPC/Ecosystems Project)

INVITED: Nox Moyake (Communications Lead, South African Centre for HPC)

INVITED: Werner Janse Van Rensburg (Science Director, South African Centre for HPC)



The Fisherman. Photo by Doug Falter, Doug Falter Photography