Re-Mapping Africa in GIS:
From Humanities to Health

Co-Chaired by
Suzanne Preston Blier, Harvard University
Julia Finkelstein, Cornell University

Co-sponsored by
The Committee on African Studies (CAS) and
Center for Geographic Analysis, Institute for Quantitative Social Science

Date: March 29-30, 2012

Location: Tsai Auditorium, CGIS Building South, Room S010
Address: 1730 Cambridge St., Cambridge, MA 02138

This two-day conference brings together scholars on GIS and Africa to share their knowledge and experiences; to explore the potential of geospatial methods in the social sciences, further humanities scholarship by critically engaging GIS methods, and promote interdisciplinary collaborative research in health and humanities in the continent of Africa.

The objective is to explore the application of geographic information systems (GIS) methods to health and humanities work in Africa, bringing together scholars from across various disciplines whose research offers answers to key questions involving Africa. Scholars represent research interests in an array of disciplines, among these health, demography, government, geology, geography, biology, archaeology, economics, architecture, and art history.

The keynote address, "Putting Peace on the Map" will be presented by Patrick Vinck, Research Scientist at the Harvard School of Public Health and Associate Faculty with the Harvard Humanitarian Initiative. The first day of this conference will include a hands-on training workshop and a web-based interactive demo of the WorldMap web mapping platform. The second day will feature the keynote address, followed by a series of topical panels incorporating short talks by the invited speakers on topics including politics, environment, health, change, diversity, methodologies and technologies.

Thursday, March 29, 2012

9:00 AM - 12:00 PM   **Hands-on Training for WorldMap Platform (Science Center, room B-09)**

2:00 PM - 4:00 PM   **Live Demo of WorldMap Platform (CGIS-South Building, room S030)**

Friday, March 30, 2012

8:30 AM - 9:00 AM   **Registration and Light Refreshments (CGIS South Building, Concourse)**

9:00 AM - 10:00 AM   **Introductions and Keynote Address (CGIS South, Tsai Auditorium)**
Opening Remarks
        Caroline Elkins and Peter Bol
Introduction of Keynote Speaker
        Suzanne Blier and Julia Finkelstein
Keynote Address: "Putting Peace on the Map "
        Patrick Vinck

10:00 AM - 10:50 AM   **Politics**   *Moderator: Biodun Jeyifo*
The Space of Time: Mapping Difference in the Pre-Colonial Yoruba City
        Suzanne Blier
Social Media as Passive Polling: Using Twitter to Map Islamist Sentiment in Egypt
        Todd Mostak
Deterring or Displacing Electoral Irregularities? Spillover Effects of Observers in Ghana
        Nahomi Ichino
Measuring Violence & Displacement in Kenya
        Andy Harris

10:50 AM - 11:00 AM   *Coffee Break*

11:00 AM - 12:00 PM   **Environment**   *Moderator: Stephen Ervin*
Investigating Tourist Geographies in the Sahara
        Aziza Chaouni
Sacred Seascapes of the Mediterranean - Sailing the Shores of North Africa & Beyond
        Jeff Howry
Space, Place, Time and Tsetse
        Joseph Messina
Sensing New Water Resources in Egypt from Space
        Magaly Koch
Community Mobilization, Spatial Mapping and Malaria Control
        Felton Earls & Mary Carlson

12:00 PM - 12:50 PM   **Health**   *Moderator: Emmanuel Akyeampong*
Anemia: Spatial Mapping in Sub-Saharan Africa
        Julia Finkelstein
Tsetse fly: Slavery and Sleeping Sickness
        Marcella Alsan
Using Geographic Information Systems to Support HIV Care in Rwanda
        Fabien Munyaneza
The Maize/Malaria Connection in Western Ethiopia
        Anthony Kiszewski

Friday, March 30, 2012

12:50 PM - 1:20 PM	*Lunch Break*

1:20 PM - 1:50 PM	*Poster Session*

1:50 PM - 2:40 PM　　**Change**　　　　　　　　*Moderator: Kirk Goldsberry*

Cannabis: An African Biogeography, 1500-1940
　Chris S. Duvall
The Texture of Change: Cloth, Commerce and Social History in Western Africa, 1650-1850
　Jody Benjamin
Boundary Softness in Historic West Central Africa
　John Thornton
Responding to Change: Mapping the Intersection of Climate Change, Conflict, and Aid in Africa
　Ashley Moran

2:40 PM - 2:50 PM　　*Coffee Break*

2:50 PM - 3:50 PM　　**Diversity**　　　　　　　*Moderator: John Mugane*

Mapping Life: Inventorying African Biodiversity
　James Hanken
Crowdsourcing and Cloud Computing for Improved Ecosystems Mapping in Sub-Saharan Africa
　Henry N. N. Bulley
Transboundary Conservation
　Meghan Spigle
The Size of Savannah Africa: a Lion's View
　Andrew Jacobson
Spatial Patterns of Health in Accra
　Günther Fink

3:50 PM - 4:50 PM　　**Methodologies and Technology**　*Moderator: S.V. Subramanian*

Food Insecurity in the Greater Horn
　Greg Husak
African Health Seen Through a Spatial Lens
　Marcia Castro
Rebuilding after the Genocide in Rwanda: Space and the Ethics of Transition
　Delia Wendel
An Incentive Design Experiment in the Health Sector: Zambia, GIS and Social Science Field Work
　Kelsey Jack
Citizen Cyberscience for Africa
　Francois Grey

4:50 PM - 5:00 PM　　**Closing Remarks**

5:00 PM - 5:10 PM　　**Fisher Prize & Davis Center Prize**

5:10 PM - 6:00 PM　　**Reception**

Center for Geographic Analysis　　　　　　**http://gis.harvard.edu**

Abstract and Biography

Keynote Address: Putting Peace on the Map
Patrick Vinck

Abstract: Over the last 10 years, our research team has applied empirical methods of research to capture the experience, opinions, and attitudes of survivors of mass violence in northern Uganda, eastern Democratic Republic of the Congo, Central African Republic and in Liberia, among others. The research methods have included population-based surveys, qualitative studies, focus groups, and ethnography. In this talk, I will focus on the digital data collection and interactive mapping tools we developed to provide results faster and more accurately, while also increasing the safety of all those involved in the research, and enabling users to explore aggregated results in near real-time. The results of the studies are featured on the recently launched www.peacebuildingdata.org, giving access to results of interviews with nearly 25,000 survivors of mass violence.

Dr. Vinck, Ph.D. is a Research Scientist at the Harvard School of Public Health and Associate Faculty with the Harvard Humanitarian Initiative (HHI). Before joining HHI in 2011, he directed and co-founded the Initiative for Vulnerable Populations at UC Berkeley's Human Rights Center, where he focused on managing and implementing empirical studies on the process of social reconstruction in countries affected by mass violence. His work is informed by several years of experience working on development projects in Africa. Vinck also-cofounded KoBoToolbox, a digital data collection project to advance human rights research. He serves as a member on the Committee on Scientific Freedom and Responsibility of the American Association for the Advancement of Science; an Adjunct Associate Professor at Tulane University's Payson Center for International Development; and a regular consultant on vulnerability analysis to the United Nations World Food Programme. He graduated as an engineer in applied biological sciences from Gembloux Agricultural University (Belgium), and holds a Ph.D. in International Development from Tulane University.

The Space of Time: Mapping Difference in the Pre-Colonial Yoruba City
Suzanne Blier

Abstract: This paper explores the complex role that idioms of tension and contestation play in pre-colonial urban life in the ancient the Yoruba city-state. In the same way that cities reveal their pasts in a diversity of ways, so too local political factors can be seen to have a critical part in the life of the city. Historic tensions revealed through this means offer a lens into the ongoing dynamics of urban engagement. GIS, I argue, offers unique insight into the political strategies that help define the city. Both temporal and spatial elements of the urban landscape and use feature in this.

Suzanne Preston Blier, the Allen Whitehill Clowes Professor of Fine Arts and of African and African American Studies at Harvard, publishes on African art, architecture, and urbanism. She is co-chair of the Africamap website.

Social Media as Passive Polling: Using Twitter to Map Islamist Sentiment in Egypt
Todd Mostak

Abstract: The recent popular uprisings in the Middle East have drawn attention to the ways in which Internet social media platforms such as Twitter and Facebook can catalyze political change. To the extent that this "new media" represents a novel avenue for expression in countries such as Egypt long characterized by a suppressed public discourse, it also presents researchers with a vast untapped source of timestamped, geocoded public opinion data. n this presentation, I employ the methods of computational linguistics to compare Egyptians' Twitter utterances with discourse mined from the Arabic-language chatrooms of Egyptian Islamist organizations such as the Muslim Brotherhood, with the goal of creating a map of how Islamist sentiment varies across Egypt. I will also present on my efforts to develop new software tools that harness the massively parallel capabilities of the computer GPU (Graphics Processing Unit) to spatially analyze and map gigabytes of social media data in real time.

Todd Mostak is currently finishing his last semester in Harvard's A.M. program in Middle Eastern Studies. After obtaining his undergraduate degree in Economics and Anthropology, he taught English in Aleppo and Damascus, Syria for a year. He then spent 16 months in Cairo as a fellow in the Center for Arabic Study Abroad (CASA) and as an Arabic-English translator for the independent Egyptian newspaper Al-Masry Al-Youm. After graduating, he plans to establish a startup company focused on providing real-time analytics and mapping from social media and other "big data" sources.

Deterring or Displacing Electoral Irregularities? Spillover Effects of Observers in a Randomized Field Experiment in Ghana
Nahomi Ichino

Abstract: In new democracies, election observers are often deployed to deter and report on fraud and violence. But they often have the unintended effect of pushing illicit activities to other alternative locations or earlier stages of the electoral process where they are harder to detect. A two-tier randomized field experiment during voter registration in 2008 in Ghana indeed shows that domestic observers appear to displace, not just deter, voter registration irregularities, with implications for future measurement and analysis of electoral fraud.

Nahomi Ichino is an Assistant Professor in the Department of Government (FAS) at Harvard University. Her research interests include the development and effects of political institutions in new democracies, particularly political parties and electoral fraud in Africa. Her current research on Ghana is forthcoming in the Journal of Politics and the British Jour-

Measuring Violence & Displacement in Kenya
Andy Harris

Abstract: My research examines the causes and consequences of political violence following Kenya's 2007-2008 election. In this talk, I demonstrate how this particular episode of violence targeted certain ethnic groups and drastically reshaped the local ethnic (and electoral) demography. I focus on a common strategy used to forcibly displace communities and discourage their return: arson. Since neither records of arson nor census data on ethnicity are available, systematic evidence of arson and its effects on specific ethnic sub-populations prove difficult to obtain. I draw on diverse sources of spatial data, from colonial maps to remote sensing data, to measure the extent and magnitude of ethnic targeting and displacement during Kenya's 2007-2008 post-election violence.

Andy is a Ph.D. candidate in Government at Harvard University, and will complete his dissertation next month. His research -- based on 2 years of fieldwork in Kenya -- focuses on Kenyan political history and economy, with an emphasis on developing news methods and data sources to understand political behavior. In September 2012, he will begin a 3-year research fellowship at Nuffield College, Oxford.

Investigating Tourist Geographies in the Sahara
Aziza Chaouni

Abstract: Since the 1992 Earth Summit in Rio, international agencies have introduced new concepts in their development agendas. To foster sustainable livelihoods, poverty alleviation should go hand-in-hand with good governance and biodiversity conservation. Within this matrix, tourism, a crosscutting and fast-growing economic activity, has appeared as a recurrent theme at international development plans worked out between national governments and international funding and development agencies such as the World Bank or the United Nations Development Program (UNDP). Hence, put at the storefront of economic development strategies, tourism is a key player at orienting and reconfiguring territories, providing them with vital infrastructure, employment, foreign exchange earnings, yet not without leaving questionable socio-cultural and environmental imprints. With its proximity to Europe, its image as ultimate frontier, wealth of desert ecosystems and cultural landmarks, the Sahara desert is no exception to tourism's multivalent phenomena. The disappearance of caravan trade routes paired with the decline of nomadic pastoralism and the rampant abandoning of oasis agriculture, have rendered tourism as one of the main sources of income for the Saharan population. This presentation argues that Saharan tourism not only recasts the meaning and identity of rural landscapes, but also introduces structuring models that subvert the conventional rural/urban, center/periphery settlement structures. In fact, with its diffuse morphology spreading over a wide terrain and embodying a variety of forms, ranging from gargantuan gated tourist compounds, national parks to temporary camps and SUV rallies, tourism generates new territorial patterns that augment and sometimes supplant existing infrastructural networks.

Aziza Chaouni is assistant professor at the John H. Daniels Faculty of Architecture, Landscape, and Design at the University of Toronto. She holds a Master of Architecture with distinction from the Harvard Graduate School of Design and a Bachelor of Science with Honors in Civil Engineering from Columbia University. Chaouni's personal research is focused both on Developing World design issues and on methodologies to integrate architecture and landscape, and more particularly trough investigating the potential of green technologies in arid climates.

Sacred Seascapes of the Mediterranean - Sailing the Shores of North Africa & Beyond
Jeff Howry

Abstract: The presentation has three parts, each relating to navigating the Mediterranean in the first millennium BCE. Ba'al is my navigator: Sailing among the ports of the Mediterranean was more than just commerce for the Phoenicians and other believers in Canaanite religion, it was a passage guided by the 'lord of high places', Ba'al. Analysis of the viewsheds projected from the high places of Ba'al shrines reveals that 'dead reckoning' navigation using the high places of Ba'al was feasible in many instances of navigation. Itineraria Phoenicia – Using written compilations ports along the North African coast as well as online sources of place names in the ancient word, a navigator's gazetteer of North African ports and beyond is being published using WorldMap as the atlas platform. The Pharos (lighthouse) at Alexandria was among the 'Seven wonders of the ancient world' and stood for nearly 1,500 years. The Pharos was a critical landmark along the African coast with its characteristically low topography. Viewshed analysis applied to the Pharos may provide insight into how the coast was navigated for hundreds of years.

Jeff Howry hangs his virtual hat at the Semitic Museum where he works on a number of GIS-related projects ranging from maritime activities of the first millennium BCE to training archaeologists and heritage site managers in the use of WorldMap. He is also the GIS analyst for the Gulf Encyclopedia for Sustainable Urbanism, a multi-year project at Graduate School of Design examining the growth ten cities in the Persian Gulf. His training includes archaeology, linguistics and social anthropology, with a particular emphasis on the analysis of trade and social change.

Space, Place, Time and Tsetse
Joseph Messina

Abstract: African trypanosomiasis (AT), a neglected tropical disease, is a zoonotic, parasitic infection of

wildlife, domesticated animals, and humans whose causative agents (parasites of the Trypanosoma brucei species complex) are transmitted by bite of the tsetse fly (genus Glossina). Approximately 8.5 million km2 in 37 Sub-Saharan Africa countries are infested with tsetse, resulting in approximately 70 million people with exposure risk. The disease is also one of the most important economic burdens in Sub-Saharan Africa, with Animal African Trypanosomiasis (AAT) reducing livestock productivity by 20% to 40% in tsetse areas. We know that tsetse occupy fundamental niche spaces that based on existing data they should not, and we know that tsetse are missing from areas where based on all habitat constraints they could exist in large and stable populations. These uncertainties make cost effective surveillance, control, and intervention efforts extremely difficult and traditional epidemiological prediction almost impossible. Here, I detail these challenges, focusing on Kenya, and present a modeling solution that accounts for these variations over space and time.

Joe Messina is an Associate Professor appointed in Geography, the Center for Global Change and Earth Observations, the African Studies Center, and the Ecology, Evolutionary Biology, and Behavior Program at Michigan State University. He received the Ph.D. in Geography from the University of North Carolina at Chapel Hill (2001) and has received research honors from NASA through the New Investigator Program, the National Institutes of Health Roadmap Program, and Sigma Xi. He has worked in the Ecuador, Thailand, China, and East Africa on human/environment interactions and land change science.

Sensing New Water Resources in Egypt from Space

Magaly Koch

Abstract: A new development corridor plan has been proposed to help alleviate Egypt's growing overpopulation along the Nile River that entails gradually extending development activities from the western side of the Nile Delta and Valley further toward the west. In cooperation with Suez Canal University in Egypt, a pilot study is being undertaken in the Aswan sector to develop new techniques for multisensor spatial data and information integration for water exploration and land use planning. Satellite borne and ground penetrating radar systems have been used to detect and delineate subsurface structures (faults, paleo-channels) that have the potential of carrying large quantities of groundwater. Images from optical satellite sensors provided information about surface sediments characteristics and their origin and deposition by the ancestral Nile (Protonile) west of Aswan. This area is promising for agricultural development in terms of water availability and soil quality.

Dr. Magaly Koch is a geologist specialized in the application of Remote Sensing and Geographic Information Systems in the study of groundwater resources and environmental change of arid and tropical regions. She has conducted research on the: (i) estimation of the ground water potential in

Sudan (Darfur and Red Sea Hills), Egypt, Oman and United Arab Emirates, (ii) evaluation of the geomorphic effects of the Gulf War in Kuwait using pre- and post-war satellite images, (iii) characterization of wetland degradation processes in Spain, (v) assessment of flash flood potential of ephemeral rivers (wadis) in Egypt, Oman, and United Arab Emirates, (vi) discovery of hidden Maya ruins in the thick rainforest of Guatemala, and (vii) relationship between landscape evolution and cultural development of the Axumite kingdom in N Ethiopia, and the possible causes for past and present-day land degradation problems in this region.

Community Mobilization, Spatial Mapping and Malaria Control

Felton Earls & Mary Carlson

Abstract: The Young Citizens (YC) Program in the Kilimanjaro Region of Tanzania engages adolescents to work as health agents to build HIV and malaria competence. This Program, evaluated by a cluster randomized controlled trial, comprises HIV education and public deliberation skills. More recently, the Program has been building malaria competence through community education and mobilization in controlling endemic malaria. Their skill in collecting GPS data, in combination with the GIS capacities of Africa Map, enables them to develop maps of the households where they provide scientific explanations and demonstrations of environmental management practices. In addition, they create maps of larval counts before and after introducing a Tanzanian larval-eating fish to experimental ponds in their neighborhoods. Spatial data is key to the next phase of this work on the effectiveness of the community mobilization and biocontrol efforts in environmental management of malaria in urban and rural areas of Northern Tanzania.

Felton Earls is Research Professor of Human Behavior and Development at the Harvard School of Public Health and Professor Emeritus of Social Medicine and Child Psychiatry at Harvard Medical School. From 1990 to 2005, he was Principal Investigator of The Project on Human Development in Chicago Neighborhoods, a multilevel, longitudinal study on the causes and consequences of exposure to urban violence. This study incorporated spatial analyses of the social dynamics of urban neighborhoods. Since 2003, he has worked on a randomized community-level trial aimed at mitigating the impact of the AIDS epidemic. Conducted in Tanzania, the work builds on ecological theory and findings of the Chicago study to strengthen community capacity to promote health.

Mary Carlson is Associate Professor of Psychiatry at the Harvard Medical School. After decades of laboratory research in neurobiology on spatial mapping of sensory areas of primate cerebral cortex, she attended the Harvard Kennedy School to study social policy addressing child health and development (1991-1992). Her research interests were redirected toward the role of early experience in neurobehavioral development, by studies of institutionalized children in Romania and community-based programs for street children in Brazil and South Africa. Together with Felton Earls, she co-directed the

Child Health and Social Ecology (CHASE), an adolescent-centered health promotion intervention in Moshi, Tanzania (2003-present). Spatial mapping, of neighborhoods and of the community mobilization activities around HIV (and now malaria), has been a major focus of her current work.

Anemia: Spatial Mapping in Sub-Saharan Africa
Julia Finkelstein

Abstract: Anemia is a severe public health problem in many countries in Sub-Saharan Africa, and poses a major threat to maternal and child health. Anemia is common in pregnancy, and is associated with an increased risk of maternal and infant death, impaired cognitive development, growth, and immune function in childhood, and reduced work capacity later in life. Approximately half of anemia is due to nutritional iron deficiency, but this may vary by geography and related socioeconomic and environmental factors. However, relatively little is known about the geographic variation in anemia in Africa. In this presentation, we explore the geographic distribution of anemia in Sub-Saharan Africa, to help inform targeted interventions and health resource allocation in anemia prevention and control.

Julia Finkelstein, MPH SM ScD is a faculty member in the Division of Nutritional Sciences, Cornell University, and a Fellow at the Center for Geographic Analysis, Harvard University. She received her Bachelor of Science degree from McGill University, Canada; Masters of Public Health degree from Brown University; and Master of Science and Doctor of Science degrees in Epidemiology and Nutritional Epidemiology from the Harvard School of Public Health. Dr. Finkelstein is co-PI of IndiaMap and contributes to the AfricaMap and WorldMap projects at the Center for Geographic Analysis, Harvard University. In her research, she applies GIS and epidemiological methods to public health research in sub-Saharan Africa and the Indian subcontinent.

Tsetse fly: Slavery and Sleeping Sickness
Marcella Alsan

Abstract: One of the puzzles of African economic history is its low population density relative to other parts of the Old World. In this paper, I investigate the role of the TseTse fly on pre-colonial African development. I identify the TseTse effect by creating a suitability index based on insect physiology and abiotic climate factors. Combining the TseTse suitability index with ethnographic data, I find that areas more suitable for the fly are characterized by lower population, less advanced agricultural technology and more indigenous slavery. As a placebo check, I use Thiessen polygons approach to apply the same methodology to the rest of the world. I find that the TseTse suitability index does not explain agricultural practices outside Africa, where the fly was absent. Simulating African development in the absence of the TseTse, I estimate that historical African institutions and population density would have been closer to that of Asia in the absence of the fly.

Marcella Alsan holds a MPH and MD and is board certified in internal medicine and infectious disease. She is currently a practicing physician at Massachusetts General Hospital and a PhD candidate in economics at Harvard. Her research is on the effect of communicable disease on institutions and culture in Africa and the use of behavioral economics to improve health outcomes.

Using Geographic Information Systems to Support HIV Care in Rwanda
Fabien Munyaneza

Abstract: Partners In Health (PIH) supports the Rwanda Ministry of Health (MoH) in providing comprehensive patient care in three districts (Kayonza, Kirehe and Burera). To improve service delivery and ensure equity in access to care, PIH has used GIS to map villages and aggregate patient data within the supported catchment areas. In the first phase, the GIS team has trained community health workers to use GPS devices and conducted thorough mapping of villages in the PIH catchment areas. In the next phase, patient data (height, weight, dates of last CD4, and missed visit status) from the Electronic Medical Records system (EMR) has been cleaned, aggregated to the village level and imported into ArcGIS for analysis. The analysis identified proportion of villages within 5km to the nearest health facility. In addition, it revealed a significant variation in proportion of underweight patients by sector, with highest rates in Rutamira and Ndego sectors in Southern Kayonza and Mushikiri sector in Kirehe. The results of the analyses were visualized in maps and shared with Medical Directors, clinicians, administrators and community health teams.

Fabien Munyaneza is a GIS Coordinator with Partners In Health (PIH) in Rwanda. His expertise is in applications of GIS in health for M&E (Monitoring & Evaluation) and research to improve health systems strengthening efforts in Rwanda. Under his guidance, the PIH-GIS team in Rwanda has been thoroughly mapping the PIH catchment areas and analyzing the distributions of potable water, malnutrition and cesarean sections (among others) to facilitate improved health service delivery. Before he joined PIH, Fabien taught primary and secondary school and worked as a Land Survey and GIS Specialist in Rwanda. In addition to his involvement in the healthcare field, Fabien is interested in wildlife conservation and management.

The Maize/Malaria Connection in Western Ethiopia
Anthony Kiszewski

Abstract: Malaria transmission has long been connected with various types of agricultural practices including irrigation via microdams and cultivation of wetland rice. Its association with maize, however, is much less appreciated and was explored on scales from puddles to villages to regions in a series of studies conducted in the Ethiopian highlands.

Tony Kiszewski is an Associate Professor of Epidemiology at Bentley University, specializing in public health entomology, and in particular the ecology of malaria vectors. His current research focuses on the use personal mosquito repellents to complement insecticide-treated bednets in Northern Ghana.

Cannabis: An African Biogeography, 1500-1940

Chris S. Duvall

Abstract: Cannabis indica, the primary source of marijuana, was introduced to East Africa from South Asia about 1000 years ago, and diffused throughout East, Central, and Southern Africa by the early 1400s. African cultures of marijuana use independently developed technical and technological innovations such as smoking and water pipes. Scholars have barely recognized these innovations, or assessed their significance in world history. In this presentation, I summarize an important impact of African marijuana knowledge: the diffusion of Cannabis between 1492 and World War II. Marijuana was a key ethnobotanical resource of the Central African Diaspora. Enslaved Africans carried marijuana seeds on slave ships with passive encouragement from slavers, who allowed captives to smoke in transport and at many destinations. Brazil received marijuana early via Portuguese slaving; the British facilitated further dispersal in the 1800s by seizing Portuguese slave ships and settling re-captives in St. Helena, Sierra Leone, Jamaica, and Liberia. From these locations, marijuana diffused elsewhere through trade and labor migration. Europeans and South Asians also had direct roles in marijuana diffusion, but geovisualization of linguistic and historical evidence shows that Africans had a foundational role in marijuana's global history—indeed, the word 'marijuana' is ultimately an African loanword.

Since 2008, I have been an Assistant Professor in the Department of Geography at the University of New Mexico. Previously I was a member of the geography faculty at Michigan State University. For my doctoral research at the University of Wisconsin, I analyzed the interacting spatial ecologies of people, trees, and chimpanzees in southwestern Mali. This research led me to examine the historical biogeography of several transatlantic tree species, which in turn made me aware of the important but often overlooked role Africans have had in the diffusion of plants and botanical knowledge in the Atlantic World. Since 2010 I have studied the historical biogeography of Cannabis, a challenging subject because marijuana prohibition has stunted research since the early 1900s, and because many historical marijuana users were subaltern peoples who were often neglected or misrepresented in source documents.

The Texture of Change: Cloth, Commerce and Social History in Western Africa, 1650-1850

Jody Benjamin

Abstract: During the period of the Atlantic slave trade, cotton textiles imported from India and Europe represented the largest category of goods used for trading on the Guinea coast. While it is known that textiles were an important commodity, even in a period dominated by the export trade in slaves, historians of the western savannah lack detail about the organization of cotton agriculture, textile manufacturing and their relationship to processes of social and historical change. I am using GIS to map the historical trajectories of this trade for the period between 1650 and 1850 by focusing on the spatial relationships between savannah market towns—such as Jenne, Kankan, and Galam—cotton farms and residential communities as part of larger research into how Africans of this region responded to shifting regional and global trade dynamics.

Jody Benjamin is a PhD Candidate in African and African American Studies with a primary field in History. He studies West Africa during the period of the Atlantic slave trade, particularly the Mande-speaking regions of Upper Guinea and Senegambia. His interests include the history of Atlantic World, African Diaspora studies, and the intellectual histories of Africa and the black Atlantic from the 18th century to the present. He has a BA in Black Studies and French from Oberlin College. He was a journalist in South Florida where he won a Society of Professional Journalists Award for his coverage of a Haitian migrant detention crisis (2002) and later earned an MFA from Columbia University in Non-Fiction Writing (2005).

Boundary Softness in Historic West Central Africa

John Thornton

Abstract: My interest in the Harvard AfricaMap project is to explore ways to present mapping of pre-colonial African history using both the mapping. technology and GIS. My starting point is a map I created in 1998 of Atlantic Africa in 1625 and which was published in my book Africa and Africans in the Making of the Atlantic World (and republished projected on a geophysical map in the Dorling Kindserly History World Atlas a few years later). My plan is to superimpose the original map on a geo-referenced map (such as one of the GoogleMaps suite) and correct borders to fit topography at the micro-level. I would then like to use GIS software to incorporate the substantial academic apparatus from the original publication into each cell (=polity). Future work might be to trace the evolution of each cell over time to create a time line of maps that could be displayed sequentially or in an animation that would illustrate, as much as is possible, the evolution of pre-colonial polities.

John K. Thornton is professor of History and African American Studies at Boston University. He received a BA from the University of Michigan and MA and PhD from UCLA, and has taught at the University of Zambia, University of Virginia, Allegheny College and Millersville University. Thornton's primary research field is the history of West Central Africa, especially the Kingdom of Kongo, but he has written about a wide range of areas, including the African Diaspora, and the history of religion, demography, warfare,

and cultural history. His most recent project sought to recast the history of the Atlantic basin to focus on intercontinental relations.

Responding to Change: Mapping the Intersection of Climate Change, Conflict, and Aid in Africa
Ashley Moran

Abstract: The complex pathways from climate changes to security impacts have demanded new datasets to fill knowledge gaps, but also new ways of presenting data to be of most use in policy planning. The new mapping tool from the Climate Change and African Political Stability program enables researchers and policymakers to visualize data on climate change vulnerability, conflict, and aid, and to analyze how these issues intersect in Africa. Where could local conflict patterns exacerbate climate-induced insecurity? Do international aid interventions target areas where climate change poses the most significant risk to sustainable development and political stability? By allowing users to analyze multiple data sources at once, the climate security mapping tool enables integrated analysis of how myriad climate change impacts and responses intersect.

Ms. Ashley McIlvain Moran is an Associate at the Robert S. Strauss Center for International Security and Law, where her work focuses on democratic legal and institutional reform, comparative law, and rule of law. Ms. Moran runs the Strauss Center's program on Climate Change and African Political Stability (CCAPS), and leads the democratic governance research team under the program. Funded by the U.S. Department of Defense, the CCAPS program is a collaborative research initiative with over 50 researchers at 13 universities in the US, Africa and Europe. The program explores how climate change, conflict, governance and aid intersect to impact African political stability and US national security.

Mapping Life: Inventorying African Biodiversity
James Hanken

Abstract: There may be as many as two billion specimens of preserved animals and plants in the world's natural history collections. Together with other observational data these specimens represent an invaluable and unique record of life on Earth, which is especially important in the current era of global climate change, human overpopulation, and environmental degradation. As one of Earth's major biodiversity "hotspots," Africa poses unique challenges to those who seek to provide ready access to such data to serve the needs of conservation, land-use planning, resource management, environmental policy, and human welfare. I will demonstrate two contemporary initiatives in biodiversity informatics that seek to address these challenges by making data available on the internet in service of scientific research, learning and education, and public policy. MCZbase (www.mczbase.mcz.harvard.edu) is an online data management system that serves digitized specimen records, images and associated metadata, including georeferenced collecting localities that can be mapped in real time, and in turn shares its content with global aggregators, such as the Global Biodiversity Information Facility (www.gbif.org). The Encyclopedia of Life (www.eol.org) seeks to organize, provide access to, and facilitate use of all information about biological species that is available in digital form.

James Hanken is Alexander Agassiz Professor of Zoology and director of Harvard's Museum of Comparative Zoology. He studied zoology at UC Berkeley and had postdoctoral training in developmental biology at Dalhousie University. At Harvard he also is Professor of Organismic and Evolutionary Biology and is affiliated with the Biological Sciences in Dental Medicine Program, Harvard School of Dental Medicine, and the Center for Health and the Global Environment, Harvard Medical School. His research focuses on evolutionary biology and systematics, as well as biodiversity informatics; he maintains field programs in Africa, Asia, and Central and South America.

Crowdsourcing and Cloud Computing for Improved Ecosystems Mapping in Sub-Saharan Africa
Henry N. N. Bulley

Abstract: Recent advances in geospatial and information technology present a unique opportunity for a multi-scale assessment of ecosystem conditions, in line with increasing emphasis on holistic ecosystems approach to sustainable resource management in African countries. In particular, cloud-based Internet GIS provides a scalable platform for collaborative collection, sharing, and visualizing geospatial data. Additionally, crowdsourcing leverages the knowledge and participation of members in a community to create or improve upon existing mapping products. There is a growing number of internet mapping tools that employ some aspects of cloud computing and crowdsourcing, including, Eye on Earth, SERVIR, and GEOSS Africa Ecosystems Mapping. This presentation will highlight results from an ongoing effort by the Africa Chapter of IALE* to crowdsource the knowledge of African scientists and resource managers in evaluating the appropriateness of the GEOSS Africa Ecosystems Mapping products for assessing ecosystem conditions in Sub-Saharan Africa. Additionally, I will discuss why we need to consolidate the emerging web mapping platforms to provide a meaningful "Geospatial Access Point" for researchers and resource managers in African countries. Such an access point could unleash the potential of cloud computing infrastructure to bridge the gap between regional centers of geospatial technology and the African user community. IALE* - International Association for Landscape Ecology

I am currently Assistant Professor at the Geography Department of Central Connecticut State University, where I teach classes on GIScience, GIS and Internet/Web mapping. Currently, my research interest follows two concurrent tracks: integration of GIS and remote sensing with spatial modeling and classification tree analyses to improve land use classifi-

cation, as well as the integration of landscape metrics with geospatial modeling to assess land use and land cover dynamics. Being a native of Ghana, I have an outreach interest to facilitate the adoption of geospatial science and landscape ecology principles for ecosystems mapping and sustainable development in Sub-Saharan Africa.

Transboundary Conservation
Meghan Spigle

Abstract: Greater Mapungubwe is one of a dozen South African Peace Parks or Transfrontier Conservation Areas. The park encompasses the borders of three nations (Botswana, South Africa, and Zimbabwe) and is internationally valued both for its cultural importance (1200AD Iron Age paintings, a UNESCO site) and its unique habitats and wildlife. Aside from captivating the interest of three sovereign states, Mapungubwe hosts a variety of public and private stakeholders; DeBeers, National Parks Trust, industrial farmers, and the native Marimani people of Zimbabwe. Nevertheless, a politically fragile Zimbabwe restrains both the betterment of its people's social welfare and the advancement of an ecologically and economically unified international park. Historically, development of South African parks was primarily motivated by colonial desire for hunting and sport. However, more recent park planning initiatives have experimented with management strategies more inclusive of indigenous community groups. In the case of the development of Greater Mapungubwe, I explore a scenario in which the Zimbabwean Maramani community could more effectively engage with and benefit from the broader Mapungubwe Peace Park through a reorganization of their agricultural and economic practices.

Meghan is an urban designer for Zimmer Gunsul Frasca Architects in Washington D.C., currently working on the Southwest Eco District project; a sustainable development plan in a multi-block area south of the National Mall for the National Capitol Planning Commission. Meghan holds a Masters in Landscape Architecture from the Harvard Graduate School of Design, where she received a travel fellowship from the Committee on African Studies for her MLA thesis regarding community conservation and tourism in a southern African international peace park. She holds a Masters in Architecture from Yale and a BS in Architecture from UVA.

The Size of Savannah Africa: a Lion's View
Andrew Jacobson

Abstract: Human population growth and concurrent land conversion for settlement, agriculture and industry exert significant pressure on native ecosystems. This pressure is particularly acute in West Africa with a rapidly growing population. Many large herbivores and carnivores in this region are disappearing quickly or are already gone. Identifying locations of human impact is vital in assessing wildlife populations and their viability. We considered off-the-shelf GIS products like land cover, human population density and agricultural lands inadequate in this region. Therefore, we set out to identify land converted from its natural setting to human-dominated land uses. To accomplish this task, we used Google Earth to draw polygons around land conversion. We could identify and include settlements, industrial uses, agriculture and even large corrals. This product, called "User-Identified Land Conversion" (UILC), therefore highlights human impacts across the region. This time-consuming process produced a unique and important product that has important differences from existing GIS products. Finally, the UILC can be applied in many situations, notably to assist in identifying remaining locations where large mammals reside.

I majored in biology at St. Olaf College, and attended the Nicholas School of the Environment at Duke University and graduated in 2010 with a Master in Environmental Management and Geospatial Analysis certificate. While at the Nicholas School I became involved in National Geographic's Big Cats Initiative and have worked as the GIS coordinator for the Duke University interns' team for the past two years. This position has furthered my passion for African wildlife, ecology and geospatial tools.

Spatial Patterns of Health in Accra
Günther Fink

Abstract: A large, and rapidly growing share of the population in developing countries lives in urban places today. In an effort to measure and document the burden of disease in modern sub-Saharan African settings, the Women's Health Study of Accra (WHSA) was launched in 2003, with a second round of household interviews conducted between September 2008 and March 2010. One of the central findings of the initial surveys was the remarkably high prevalence of chronic disease, as well as the rather weak relation between ill health and wealth at the individual level. In this paper, we analyze spatial patterns of health, with a particular focus on urban slum dwellings as well as the differences between self-assessed health vs. biomarker-based measures of physical well-being.

Günther Fink is Assistant Professor of International Health Economics at the department of Global Health and Population, Harvard School of Public Health. His research has covered a wide range of topics related to economic development, with a particular focus on the interactions between health and human capital on one side, and economic welfare on the other. Dr. Fink is currently the PI of the Zambia Early Childhood Development Project, a longitudinal study which measures the returns to early childhood investment in health and education.

Food Insecurity in the Greater Horn
Greg Husak

Abstract: Food insecurity results from any of a number of factors including inadequate rains, excessive heat, lack of available seed, vulnerable populations, low

farmer incentive, market forces and poor governance. The Famine Early Warning System Network (FEWS NET) is a US Agency for International Development (USAID) project designed to monitor food insecurity in the developing world. Understanding the spatial characteristics of the factors contributing to food security assists in anticipating locations facing hardship. Identification of critical locations involves a synthesis of satellite-derived meteorological data, maps of livelihoods, crop models, ground-sampled information and any other available input, with the hope of reducing the human impact of these conditions. This presentation will highlight some key datasets FEWS NET relies on to initiate activities to mitigate the threat of food insecurity.

Greg Husak is an Assistant Researcher in the Department of Geography at University of California, Santa Barbara. His research efforts focus on forecasting rainfall during a crop growing season, reducing uncertainty in crop production estimates, and developing tools to better monitor and define crop conditions based on remotely sensed data. He is the principal investigator at the Climate Hazards Group, a research unit composed of field scientists in various regions of Africa, graduate students, post-doctoral researchers and visiting professors.

African Health Seen Through a Spatial Lens
Marcia Castro

Abstract: The presentation will illustrate how spatial methods and technologies have opened new possibilities for the study of health-related data. Ranging from visualization, spatial autocorrelation, combination of household and satellite derived data, and spatial statistical analysis, mapping health in Africa (currently and historically) has gained valuable perspectives that have helped and continues to help the planning, implementation, and monitoring of targeted interventions.

Marcia Castro is an Assistant Professor of Demography in the Department of Global Health and Population, Harvard School of Public Health, and an Associate Faculty of the Harvard University Center for the Environment. Her research focuses on transmission and control of vector-borne diseases (particularly malaria), environmental change and health, Amazon frontier expansion, spatial methods applied to social sciences, and population dynamics and demographic methods. She has applied geographical information systems, remote sensing, and spatial statistics to her research, as well as proposed novel methods in spatial analysis. She has on-going projects in the Brazilian Amazon and in Africa (Tanzania and Ghana).

Rebuilding after the Genocide in Rwanda: Space and the Ethics of Transition
Delia Wendel

Abstract: During Rwanda's post-1994 transition from conflict, the government developed several strategies wherein rebuilding the built environment was explicit-ly linked to rebuilding social and political systems. My PhD research explores four such spatial peacebuilding strategies: 1) the 1996 and 2004 villagisation policies; 2) the 'bye-bye nyakatsi' program to replace grass roofs on houses country-wide; 3) the preservation of genocide sites; and 4) the Radio Soap Opera 'Musekeweya'. The case studies illustrate a range of types of relations between spatial and sociopolitical rebuilding embedded within: human settlement planning (villagisation), architectural aesthetics and politics (bye-bye nyakatsi), memory studies and cultural heritage (genocide site preservation), and parallels between actual and imagined community spaces (radio soap opera). For the purposes of the 'Re-mapping Africa' conference, I will present the inquiries and methodological frameworks that guide my exploration of these four case studies. In doing so, I hope to demonstrate how a spatial and material culture approach brings a unique perspective to studies of the dynamics of conflict and mechanisms of conflict resolution.

Delia Wendel is a PhD candidate affiliated with Harvard's Graduate School of Design, where she researches post-conflict and post-disaster rebuilding strategies. Her dissertation research focuses on postgenocide Rwanda, where rebuilding architecture & settlements is intimately intertwined with sociopolitical reconciliation. In addition to a Professional Architecture degree, she holds degrees in Cultural Geography (MSc, University College London) and Architectural History and Theory (MDesS, Harvard GSD). In 2009 Delia worked for UNHABITAT as a research consultant, and from 2008-2011 as a tenure-track Lecturer at the University of Edinburgh.

An Incentive Design Experiment in the Health Sector: Zambia, GIS and Social Science Field Work
Kelsey Jack

Abstract: A substantial body of research investigates the design of incentives in firms, yet less is known about incentives in organizations that hire individuals to perform tasks with positive social spillovers. We conduct a field experiment in which hairdressers and barbers in Lusaka, Zambia are hired by a public health organization and randomly allocated to four groups. Salons in the control group receive a standard volunteer contract, whereas agents in the three treatment groups receive small financial rewards, large financial rewards, and non-financial rewards, respectively. To avoid spatial spillovers across treatments, the unit of randomization is a cluster of agents delineated by a grid imposed over the city. Buffer zones between clusters are excluded from the study. We find that non-financial rewards are more effective at eliciting effort than either financial rewards or the volunteer contract. Non-financial rewards elicit effort both by leveraging intrinsic motivation for the cause and by facilitating social comparison among agents. We identify the social comparison effect through the density of agents in each cluster and find that the effectiveness of non-financial rewards is increasing in the number of neighboring agents.

Kelsey Jack joined the Economics Department at Tufts University in 2011. She received her BA from Princeton University in Public and International Affairs and her PhD in Public Policy from Harvard University, followed by a year as a Post Doctoral Affiliate at MIT. Kelsey's research explores incentive based approaches to encourage the private provision of public goods and the design of incentives for pro-social behavior with an applied focus on the environment in developing countries. Her research combines theories from environmental economics, contract theory and development economics with rigorous empirical evidence.

Citizen Cyberscience for Africa

Francois Grey

Abstract: The Citizen Cyberscience Centre is a partnership between CERN, the University of Geneva and UNOSAT, the operational satellite applications programme. Our mission is to promote the use of citizen cyberscience (volunteer computing, volunteer thinking and volunteer data collection) by researchers in developing regions. In this talk, I will discuss several examples of citizen cyberscience projects we have helped initiate or develop, and that are finding useful applications in Africa. These include: MalariaControl.net, a volunteer computing project developed by the Swiss Tropical Institute, which is used for large-scale epidemiological modeling in Africa; Cybermappr, a volunteer thinking platform for geotagging data, and its application by UNOSAT to damage assessment in Libya; Epicollect a mobile-phone based epidemiological data collection platform developed by Imperial College; a project to transcribe historical documents in bushman language, developed by the University of Cape Town. I will argue the importance citizen cyberscience as a low-cost, high visibility approach for scientists with limited resources to make a research impact. I will discuss the issue of data reliability and accuracy when involving non-expert volunteers on the Web. Finally, I will emphasize the importance of grassroots hands-on events ("hackfests") in initiating new research projects, illustrating this with examples of events we have run in Africa and elsewhere.

Francois Grey is Professor of Distributed Scientific Computing and Deputy Director at Tsinghua University's first interdisciplinary research centre, the Centre for Nano and Micro Mechanics (CNMM). He is also the coordinator of the Citizen Cyberscience Centre in Geneva, a partnership between CERN, the UN Institute for Training and Research and the University of Geneva. Prior to moving to China in 2008, he spent six years at CERN as manager of IT Communications, launching CERN's LHC@Home volunteer computing project and promoting citizen cyberscience in the developing world through the Africa@home and Asia@home initiatives.

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