Shaping Landscapes and Building Expertise:

The role of imperial technology in the making of the 19th and 20th century world

March 10 - 13

Portugal - Lisbon - 2013

Organization

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Sponsors

Shaping Landscapes and Building Expertise
The role of imperial technology in the making of the 19th and 20th century world

2013, March 10 - 13

Programme

Sunday, 10

18:30 — *Welcome Reception Hotel Alif*

Monday, 11

9:00 — *Registration and coffee*

10:30 — *Opening Session*

11:00 — ***S1**: Agriculture, forestry and expertise*
Chair: Marta Macedo

- *Building tropical agricultural expertise in late Portuguese Empire*
  Cláudia Castelo
- *The first Mozambique forestry works. The Portuguese foresters.*
  Micaela Martinez Benavente and Ignacio Garcia Pereda
- *Stabilizing Properties: The Transformations of Rubber at the Turn of the Century*
  Carlin Wing
- *White seeds, factories and institutions: cottoning on Mozambique's soft black hair - the Botanic Mission to Mozambique (1942-1948)*
  Patricia Conde, Susana Saraiva, Ana Cristina Martins

13:00 — *Break for Lunch*

14:30 — ***S2**: Networking the empire*
Chair: Maria Paula Diogo

- *Locality of a Global World - facts and reflects in the Lusitanian land*
  Ana Paula Silva
- *Submarine telegraphy as an imperial technology in the second half of the XIXth century (1851-1902)*
  Andrea Giuntini
- *The role of peripheral countries in the construction of the modern global telecommunications system: the case of Spain*
  Angel Calvo
- *The deployment of submarine cables on the Brazilian coast*
  Mauro Costa da Silva, Ildeu de Castro Moreira

***S3**: Food-production sciences and imperial enterprises*
Chair: Cláudia Castelo

- *Peripheral metropolises and agrarian landscapes: phosphates and the (re)colonization of Western Sahara*
  Lino Camprubí
- *The coffee empire: Portuguese agricultural scientists in colonial Angola (1926-1961)*
  Maria do Mar Gago
- *Histories of co-production: following colonial cocoa and their actors*
  Marta Macedo

16:30 — *Coffee Break*

17:00 — Presentation of the book
A Outra face do Imperio: Ciência, Tecnologia e Medicina
Maria Paula Diogo and Isabel Maria Amaral, by Teresa Salomé Mota

Auditório Sedas Nunes | Auditório Sedas Nunes | Sala Polivalente

Shaping Landscapes and Building Expertise
The role of imperial technology in the making of the 19th and 20th century world

2013, March 10 - 13

Programme

Tuesday, 12

9:30 One century of techno-scientific policies in Spain and in Russia: an essai of parallel study (early18th-early 19th centuries)
Irina Gouzevitch

10:30 *Coffee break*

11:00

Auditório Sedas Nunes	Auditório Sedas Nunes	Sala Polivalente
S4: Mosquitoes and empires *Chair: Ana Carneiro*		**S5: Empire in motion** *Chair: Luis Carolino*
The fight against animal trypanosomiasis in 20th century colonial Mozambique Bárbara Direito		*Technologies of identification and documentation of natives in Colonial Mozambique (1897-1960)* Débora Scarso Quaresma
Expertise and tropical medicine in Africa: the missions on trypanosomiasis at the Tropical Medicine Institute (1945-1966) Isabel Amaral, Ana Rita Lobo		*Empire and life: biography as an approach to imperial and colonial science and technology* Pedro M. P. Raposo
Francisco Cambournac (1903-1994) and the expertise on the study of metropolitan and colonial malaria in Portugal Ana Rita Lobo		*Assembling Tropical Military Barracks: Experimentation, Heterogeneous Engineering and Biopolitics in British Colonial Networks* Jiat-Hwee Chang
Negotiating territories and consensuses. Missions to study and fight the sleeping sickness in Portuguese Guinea (1945-1974) Luís Manuel Neves Costa		*The Jesuit contribution to the development of the Philippine meteorological office* Josep Batllò

13:00 *Break for Lunch*

14:30

Auditório Sedas Nunes	Auditório Sedas Nunes	Sala Polivalente
S6: Rebuilding empires, engineering nation-states *Chair: Fátima Nunes*		**S7: Colonial spaces in the making** *Chair: Álvaro Ferreira da Silva*
The Rise of the State Technical Corps and the Building of Imperial Technical Regime in Russia Dmitri Gouzevitch		*Europeanizing, Civilizing or Exploiting: The Role of Imperial Britain in the Making of Nigeria in the 20th Century* Ibrahim Khaleel Abdussalam
Colonial Engineers and Knowledge Transfer. The Paradoxical Case of Spanish Irrigation Samuel Garrido		*Ottoman Engineer, Bureaucrat and their Identity around Electrification of Istanbul (1876-1923)* Duygu Aysal Cin

15:30 *Coffee Break*

16:00

Auditório Sedas Nunes	Auditório Sedas Nunes	Sala Polivalente
Building for Science, Science for Building: A Critical Architectural History of Building the First University in Istanbul in Mid-Nineteenth Century Göksun Akyürek		*Diplomatic derailing: African transcontinental railways and European politics* Maria Paula Diogo
Agronomic and forestry engineering and the nineteenth century Spanish Empire, 1838-1898: two separate worlds? Juan Pan-Montojo		*Shaping the Revolutionary World: Colonial Expertise Translated and Re-Born in Post-Colonial Egypt* William Carruthers
Rebuilding empires, engineering nation-states: Knowledge and the Re-shaping of Political Landscapes in the Margins of Europe (1700s-1920s) Darina Martykanova, Irina Gouzevitch, Ana Cardoso de Matos		

20:30 *Conference Dinner Clube de Fado (Alfama)*

Shaping Landscapes and Building Expertise
The role of imperial technology in the making of the 19th and 20th century world **2013, March 10 - 13**

Programme

Wednesday, 13

10:00	Sleeping Sickness and Western Medicine, 1900-1940 *Daniel Headrick*	
11:00	*Coffee break*	
11:30	**S8: Housing experiments** *Chair: Ana Simões*	
	Post-Colonial Careering: Colonial Administrators and the Management of Post-War British New Towns Hannah Neate, Ruth Craggs	
	The prefabricated building Processess in the Tunisian reconstruction Nesrine Azizi	
	Following engineers and architects through slums: history and present of the technoscience of slum intervention in the Portuguese-speaking landscape Eduardo Ascensão	
13:00	*Break for Lunch*	
14:30	**S9: Infra-structures and colonial engineering** *Chair: Pedro Raposo*	**S10 : Mapping Borders** *Chair: Teresa Salomé*
	Shaping landscapes and building expertise: the role of the Baro-Kano railway in the making of imperial dream Shehu Tijjani Yusuf	*Erasing Ambiguity from the Map: the Sino-Burmese Border Dispute, 1892-94* Eric Vanden Bussche
	The Mormugão railway in Portuguese India: political context and technical difficulties (1878-1902) Hugo Silveira Pereira and Ian J. Kerr	*Mozambique borders in the late 19th century: between colonial imposition and scientific performance* Ana Cristina Roque
	Moving across the empire: Analyzing the local Public Works Departments technical boards in the oriental provinces Alice Santiago Faria	*The Colonizer in the Computer: The British Influence in Palestinian Authority Cartography, 1993-2000* Jess Bier
	Luanda-Ambaca: the first inland railway in the Portuguese colony of Angola Bruno Navarro	*Siberia: Inner Colony or New Heartland of Russia: A Role of S&T in Changing Siberian Image and Self-Identification* Evgeny Vodichev
16:30	*Coffee Break*	
17:00	Presentation of the book *Projectar e Construir a Nação*, Marta Macedo, by José Luis Cardoso	

Auditório Sedas Nunes | Auditório Sedas Nunes | Sala Polivalente

Invited Talks:

One century of techno-scientific policies in Spain and in Russia : an essai of parallel study (early18th-early 19th centuries)

Irina Gouzevitch, Centre Maurice Halbwachs, CNRS, Paris, France

Sleeping Sickness and Western Medicine, 1900-1940

Daniel Headrick, *Roosevelt University, Chicago, United States*

Session:

S1 Agriculture, forestry and expertise

S2 Networking the empire

S3 Food-production sciences and imperial enterprises

S4 Mosquitoes and empires

S5 Empire in motion

S6 Rebuilding empires, engineering nation-states

S7 Colonial spaces in the making

S8 Housing experiments

S9 Infra-structures and colonial engineering

S10 Mapping borders

MONDAY, 11

Opening Session

Morning sessions

S1: Agriculture, forestry and expertise

Chair: Marta Macedo

Building tropical agricultural expertise in late Portuguese Empire
Cláudia Castelo (Instituto de Investigação Científica e Tropical)

The first Mozambique forestry works. The Portuguese foresters.
Micaela Martínez Benavente and Ignacio García Pereda (Euronatura)

Stabilizing Properties: The Transformations of Rubber at the Turn of the Century
Carlin Wing (New York University)

White seeds, factories and institutions: cottoning on Mozambique's soft black hair – the Botanic Mission to Mozambique (1942-1948)
Patrícia Conde, Susana Saraiva, Ana Cristina Martins (Instituto de Investigação Científica Tropical)

Afternoon sessions

S2: Networking the empire

Chair: Maria Paula Diogo

Locality of a Global World – facts and reflects in the Lusitanian land
Ana Paula Silva (CIUHCT, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa)

Submarine telegraphy as an imperial technology in the second half of the XIXth century (1851-1902)
Andrea Giuntini (Dipartimento di Economia, Università di Modena e Reggio Emilia)

The role of peripheral countries in the construction of the modern global telecommunications system: the case of Spain
Ángel Calvo (University of Barcelona, Spain)

The deployment of submarine cables on the Brazilian coast.
Mauro Costa da Silva (Colégio Pedro II), Ildeu de Castro Moreira (Federal University of Rio de Janeiro)

S3: Food-production sciences and imperial enterprises

Chair: Cláudia Castelo

Peripheral metropolises and agrarian landscapes: phosphates and the (re)colonization of Western Sahara
Lino Camprubí (TEUS - Universidad Autónoma de Barcelona)

The coffee empire: Portuguese agricultural scientists in colonial Angola (1926-1961)
Maria do Mar Gago (Instituto de Ciências Sociais – Universidade de Lisboa)

Histories of co-production: following colonial cocoa and their actors.
Marta Macedo (CIUHCT, Faculdade de Ciências, Universidade de Lisboa)

TUESDAY, 12

Invited talk

One century of techno-scientific policies in Spain and in Russia : an essai of parallel study (early18th-early 19th centuries)

Irina Gouzevitch

Morning sessions

S4: Mosquitoes and empires

Chair: Ana Carneiro

The fight against animal trypanosomiasis in 20th century colonial Mozambique
Bárbara Direito (Institute of Social Sciences, University of Lisbon)

Expertise and tropical medicine in Africa: the missions on trypanosomiasis at the Tropical Medicine Institute (1945-1966)
Isabel Amaral, Ana Rita Lobo (CIUHCT, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa)

Francisco Cambournac (1903-1994) and the expertise on the study of metropolitan and colonial malaria in Portugal
Ana Rita Lobo (CIUHCT, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa)

Negotiating territories and consensuses. Missions to study and fight the sleeping sickness in Portuguese Guinea (1945-1974)
Luís Manuel Neves Costa (Universidade de Coimbra/CRIA)

S5: Empire in motion

Chair: Luis Carolino

Technologies of identification and documentation of natives in Colonial Mozambique (1897-1960)
Débora Scarso Quaresma (FCSH-UNL)

Empire and life: biography as an approach to imperial and colonial science and technology
Pedro M. P. Raposo (CIUHCT, Faculdade de Ciências, Universidade de Lisboa)

Assembling Tropical Military Barracks: Experimentation, Heterogeneous Engineering and Biopolitics in British Colonial Networks
Jiat-Hwee Chang (National University of Singapore)

The Jesuit contribution to the development of the Philippine meteorological office
Josep Batlló (Instituto D. Luís (IDL), Faculdade de Ciências, Universidade de Lisboa

Afternoon sessions

S6: Rebuilding empires, engineering nation-states

Chair: Fátima Nunes

The Rise of the State Technical Corps and the Building of Imperial Technical Regime in Russia
Dmitri Gouzevitch (EHESS, Paris)

Colonial Engineers and Knowledge Transfer. The Paradoxical Case of Spanish Irrigation
Samuel Garrido (Department of Economics. Universitat Jaume I)

Building for Science, Science for Building: A Critical Architectural History of Building the First University in Istanbul in Mid-Nineteenth Century
Göksun Akyürek (Bahçesehir üniveristy, Istanbul)

Agronomic and forestry engineering and the nineteenth century Spanish Empire, 1838-1898: two separate worlds?
Juan Pan-Montojo (Universidad Autónoma de Madrid)

Rebuilding empires, engineering nation-states: Knowledge and the Re-shaping of Political Landscapes in the Margins of Europe (1700s-1920s)
Darina Martykanova (CSIC, Madrid), Irina Gouzevitch (Centre Maurice Halbwachs), Ana Cardoso de Matos (CIDEHUS, Universidade de Évora)

S7: Colonial spaces in the making

Chair: Álvaro Ferreira da Silva

Europeanizing, Civilizing or Exploiting: The Role of Imperial Britain in the Making of Nigeria in the 20th Century.
Ibrahim Khaleel Abdussalam (Department of History, Bayero University, Kano-Nigeria)

Ottoman Engineer, Bureaucrat and their Identity around Electrification of Istanbul (1876-1923)
Duygu Aysal Cin (Bilkent University, Turkey)

Diplomatic derailing: African transcontinental railways and European politics
Maria Paula Diogo (CIUHCT, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa)

Shaping the Revolutionary World: Colonial Expertise Translated and Re-Born in Post-Colonial Egypt
William Carruthers (Department of History and Philosophy of Science, University of Cambridge)

WEDNESDAY, 13

Invited talk

Sleeping Sickness and Western Medicine, 1900-1940

Daniel Headrick

Morning session

S8: Housing experiments

Chair: Ana Simões

Post-Colonial Careering: Colonial Administrators and the Management of Post-War British New Towns
Hannah Neate and Ruth Craggs (University of Central Lancashire and University of Hull)

The prefabricated building Processess in the Tunisian reconstruction
Nesrine Azizi (Ph.D student)

Following engineers and architects through slums: history and present of the technoscience of slum intervention in the Portuguese-speaking landscape
Eduardo Ascensão (Centro de Estudos Geográficos – UL)

Afternoon session

S9: Infra-structures and colonial engineering

Chair: Pedro Raposo

Shaping landscapes and building expertise: the role of the Baro-Kano railway in the making of imperial dream
Shehu Tijjani Yusuf (Bayero University, Kano-Nigeria)

The Mormugão railway in Portuguese India: political context and technical difficulties (1878-1902)
Hugo Silveira Pereira and Ian J. Kerr (CITCEM - FLUP; U. Manitoba, SOAS - U. London)

Moving across the empire: Analyzing the local Public Works Departments technical boards in the oriental provinces
Alice Santiago Faria (CHAM - FCSH-UNL/UA; CIUHCT, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa)

Luanda-Ambaca: the first inland railway in the Portuguese colony of Angola
Bruno Navarro (CIUHCT, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa)

S10: Mapping borders

Chair: Teresa Salomé

Erasing Ambiguity from the Map: the Sino-Burmese Border Dispute, 1892-94
Eric Vanden Bussche (History Department, Stanford University, USA)

Mozambique borders in the late 19th century: between colonial imposition and scientific performance
Ana Cristina Roque (IICT - Tropical Research Institute, Lisbon)

The Colonizer in the Computer: The British Influence in Palestinian Authority Cartography, 1993-2000
Jess Bier (University of Maastricht)

Siberia: Inner Colony or New Heartland of Russia: A Role of S&T in Changing Siberian Image and Self-Identification
Evgeny Vodichev (Institute of Geology and Geophysics, RAS, Siberian Branch and Novosibirsk State Technical University)

Book presentations

Monday, 11 : 17H00 **Auditório Sedas Nunes**

A Outra face do Império: Ciência, Tecnologia e Medicina (sécs. XIX-XX)

Maria Paula Diogo, Isabel Maria Amaral (eds)

presented by Teresa Salomé Mota

Wednesday, 13 : 17H00 **Auditório Sedas Nunes**

Projectar e Construir a Nação

Marta Macedo

presented by José Luis Cardoso

Alternative program for the members of the telegraph interest group

Tuesday, 12

10:00: Meeting at ICS and departure to Saint Julians telegraph station.
11:00: Visit to Saint Julians telegraph station. The director, Mr. David Smith, will shortly present the history of this institution and will lead the visitors along the old submarine cable station.
12:30: Departure to Cascais
13:00-14:00: Lunch offered by the municipality of Cascais to the enrolled participants.
14:00 -17:00: workshop *O mundo dos cabos submarinos - património transnacional* (Casa Santa Maria). In this workshop participants will discuss the possibilities of proposing submarine cables and telegraph networks to the UNESCO programs for heritage safeguard.
17:00: Return to Lisbon.

This program is sponsored by the municipality of Cascais (Câmara Municipal de Cascais) and required previous enrolment (now closed).

(contacts: Ana Paula Silva)

Invited Talk

One century of techno-scientific policies in Spain and in Russia : an essai of parallel study (early18th-early 19th centuries)

Irina Gouzevitch, Centre Maurice Halbwachs, CNRS, Paris, France

Spain and Russia ... Everything seems to distinguish, at first glance, these two countries situated at both extremities of Europe: geography and climate, temperament and traditions, religion and cultural-historical seniority... Although significant, these differences are not sufficient, however, to explain a deeply rooted feeling of attraction and mutual interest on which historians from both sides did not cease to insist. Besides the political solidarity (resistance to the invasions and revolutionary movements), another important argument put forward by the promoters of comparative studies is to be taken into account – a set of 'points of recognition', which made comparable, and thus better visible for each other - some historical situations. Such an approach consisted specifically in updating parallelisms in the historical development of two countries, at certain times, in similar events that commonly marked the traditions, culture and the social psychology of both peoples.

Our examples will deal with the "long 18th century" with its set of important political and military events (coalition wars, dynastic wars and internal disorders of all kinds) in Spain and in Russia that provoked periodical crisis of power. The issue was then commonly seen in the building of a new legitimacy based on the principle of modernity, or otherwise, of a new technical and administrative rationality specific to the emerging absolutism.

To analyze from this point of view some observed parallel dynamics in the building of imperial technical regimes in Russia and Spain will be our main point in this paper. This process, stimulated by both external (international prestige) and internal (authority and territorial control) imperatives being intimately linked with the professionalization of military and civil engineers, we will examine the way in which both countries could solve this problem. We will namely focus our attention on the "Europe-oriented" policy of searching for professional models, including disciplinary (set of necessary knowledge), institutional (engineering schools) and administrative (technical corps). We will also consider a different issue reserved in Spain and Russia to the big academic project and propose an explanation of this phenomena using two historical concepts : those of 'bordering cultures' (V. Bagno) and of 'imperial machine' (J.E. McClellan et F. Regourd).

Invited Talk

Sleeping Sickness and Western Medicine, 1900-1940

Daniel Headrick, Roosevelt University (Emeritus), Chicago, United States

Key Words: ***Sleeping Sickness, French Equatorial Africa, Epidemiology, Chemotherapy***

Scientific medicine is among the most important technologies Europeans brought to their colonies in the late nineteenth and early twentieth centuries. Tropical Africa possessed a particularly dangerous disease environment, one that had kept Europeans at bay for almost four centuries. When the Europeans penetrated and conquered Africa in the late nineteenth century, their presence provoked severe epidemics of sleeping sickness, followed, decades later, by efforts to contain them. In the process, they not only introduced modern medical technologies and methods to Africa, but their efforts also led to several advances in medicine.

Human sleeping sickness (or trypanosomiasis) is caused by the protozoa Trypanosoma brucei. It is transmitted from human to human by tsetse flies that live in the vegetation along rivers in tropical Africa. When these protozoa invade the blood stream, they cause fever, headaches, joint pains, and the swelling of the lymph nodes in the neck. If not treated, the trypanosomes penetrate the brain, causing confusion, sleepiness, mental deterioration, coma, and death.

The disease had long been present in a few isolated areas. Starting in the 1880s, when Europeans and their porters and soldiers invaded tropical Africa, the disease spread throughout the Great Lakes region and the equatorial rainforest, as far south as Mozambique and Rhodesia and as far north as Cameroon. Along with other colonial exactions and disruptions, it contributed to a decline in population in many regions.

The European response varied with the prosperity of the colony and the interests of the colonial power. The British, following the advice of epidemiologist Ronald Ross, used an ecological approach, making Africans cut down the vegetation along streams and rivers in order to destroy the habitats of the tsetse flies. Meanwhile, two Germans, bacteriologist Robert Koch and immunologist Paul Ehrlich, collaborated on developing drugs that would specifically target the trypanosomes that caused sleeping sickness; in so doing, they created a new branch of medicine, chemotherapy.

In their equatorial African colonies Gabon, Congo, Chad, and Ugangi-Shari, the French attempted to stem the epidemic by inoculating as many Africans as they could with the new drugs, especially in highly infected areas and along trade routes. Their goal was not to cure the sick but to eliminate the trypanosomes from their blood in order to prevent the infection of healthy people. Their goals were admirable, but in practice, success was postponed for lack of funds and personnel. Not until the 1930s did the health of Africans improve and their numbers begin to grow.

S1 : Agriculture, forestry and expertise

Building tropical agricultural expertise in late Portuguese Empire

Cláudia Castelo, Instituto de Investigação Científica Tropical (IICT)

keywords: *Agriculture, Late colonialism, DevelopmentPlans*

The late colonial imperialism required technical and scientific knowledge and turned to experts for advice and guidance, namely within sate driven development policies. In the Portuguese case, although politicians and Government authorities recognized the importance of scientific and technical expertise and practice, the state faced a lack of agricultural and forest engineers for the colonial technical services, which was considered a "national problem".

Given the scarcity of scientific and technical staff in the colonies, the Estado Novo created in the metropole, within the Junta de Investigações do Ultramar (Portuguese Overseas Research Board), temporary research units for conducting soil surveys in the colonies and supporting the agricultural initiatives of the Planos de Fomento do Ultramar (Portuguese Overseas Development Plans), such as irrigation and white settlement schemes. The agricultural engineers that headed and worked in those research missions, mainly professors and former students of Instituto Superior de Agronomia - ISA (Agricultural Science High Institute), acquired a local knowledge and a field practice - sometimes in several colonial territories - that would be useful and valuable in their academic carriers and activities in Europe, and also in their interaction with the political power. While the Estado Novo used scientific and technical expertise to (re)legitimise the Portuguese late Empire in Africa; the JIU's agricultural engineers would use their colonial experience to get scientific and professional recognition, in the national and international arena, and to gain political influence and room for manoeuvre, sometimes to criticize Portuguese settlers and colonial administration practices and point out alternative views of development.

The first Mozambique forestry works. The Portuguese foresters.

Micaela Martínez Benavente, Ignacio García Pereda, Euronatura

keywords: *Forestry, Mozambique, colonial technology*

The independent Mozambique inherited from Portuguese colonialism a weak, neglected and fragmented forestry national administration. However, this was not due to a lack of knowledge, poor legislation or a disinterested Forest Services, but to the dependence of the forestry development to the agricultural interests of the metropolis.

But even if this weakness, the 66 years of forestry works that happened between the first forest flora study commanded by the Portuguese colonial government (Thomas R. Sim: Forest Flora and Forest Resources of Portuguese East Africa) and the 1974 Mozambique independence, were witness of very complex process of forestry science and technology appropriation. To study this process, it's not enough the recent perception of it as a simple reordering of indigenous knowledge within the European forestry canon.

In 1960 Alfaro Cardoso published his work Madeiras of Mozambique that still remains as one of the most extensive in terms of technical properties of native wood. Had this knowledge been transferred to the industry, a diversification of the species would have been possible thus reducing the abuse some species suffered. The cost of opportunity of diversification turned out to be significant.

Forestry legislation in Mozambique was always ahead of her time, with the first exclusive colonial rule published in 1921, which called for operational plans, imposing fees and requiring reforestation of land exploited, contemplating sustainability concepts not usual in its historical context. However, the Forest Service staff was outrageously reduced throughout the Colonial period to implement dictated by legislation. This situation was constant and meager staff complaints are documented from 1929 until independence.

In fact, when FAO reached Mozambique after independence and tried to organize the Forest National Administration and the Forestry sector, they found very valuable the previous work made by Portuguese and tried to continue it. This essay seeks to show the complex reciprocity involved in the making of the first Mozambique forest science within the colonial context. It's based on the example of the first Portuguese foresters works in this colony during those years. It examines the specificities of intercultural encountering the Africa colony, the formalized institutions that were engendered, and the kind of forestry knowledge practices that emerged.

Stabilizing Properties: The Transformations of Rubber at the Turn of the Century

Carlin Wing, New York University

keywords: *Rubber Technology Plantation Stabilization*

This paper will focus on transformation of rubber as material, and the transformations it in turn wrought on material landscapes around the world at the turn of the century. I will define rubber as a set of desired and worked towards properties that, in this era, existed in relation to a range of imperial property forms. Rubber was first stabilized in the 1840s. That is, its undesirable properties (such as its smell and tendency to melt in the sun) were suppressed, and its desirable elastic and waterproof properties were amplified and otherwise brought under control. Once rubber's properties had been sufficiently stabilized to transform it into a critical industrial material, pressure grew to stabilize the supply. At the turn of the century, with the invention of the pneumatic tire and the automobile, highway systems were on the horizon, and demand for rubber skyrocketed. Grim massacres occurred at sites of natural rubber extraction in the Putamayo and the Congo, fundamentally reshaping the conditions of possibility for those places and peoples. Meanwhile the plant was permanently transforming the landscapes of British India, Malyasia, and Singapore, as the British transformed it into a plantation crop. As early as the 1880s, experiments were done to find a synthetic substitute, and the cutting of supply chains during the World Wars pushed this development of the elastic material to its conclusion. In a century's time rubber went from being a novel material to one so desperately required material that the risk of not having access to it spurred a series of dramatic transformations. This is a story about a material that acts as a buffer against risk and the transformations brought on by the drive for its stabilization.

White seeds, factories and institutions: cottoning on Mozambique's soft black hair - the Botanic Mission to Mozambique (1942-1948) -

Patrícia Conde, Susana Saraiva, Ana Cristina Martins, Instituto the Investigação Científica Tropical (IICT - Tropical Research Institute)

keywords: *Cotton; Mozambique; Science; Colonialism*

Cotton was one of the colonial commodities that played a central role in the making of the European empires. In the Portuguese case its importance was readdressed soon after the military coup that toppled the First Republic (1910-1926) and led to the creation of the Estado Novo (New State) (1933-1974). Regulation on its production was supported by a large yet strict legislative corpus that affirmed the nationalistic and centralizing nature of the new regime, broadly framed under the aegis of the civilizing mission. Additionally, science and technology played a crucial part in the colonization process and in the cost-effective exploitation of this natural resource.

In 1942, under the auspices of the Board for Geographical Missions and Colonial Research (Junta das Missões Geográficas e de Investigações Coloniais), an entity created (1936) within the Ministry for the Colonies to conduct and promote scientific research in the overseas territories under Portuguese jurisdiction, a botanic mission was led in Mozambique. Although its immediate purposes might be considered just from this branch of knowledge, its ties to the political and economic agenda did not disregard the concerns on the colony's cotton production.

Throughout three expeditions (1942, 1944-45 and 1947-1948) carried out over more than 70 000 kilometers, The Botanic Mission to Mozambique (BMM) not only assessed the potentialities of the large regions of the colony that had been granted to the chartered companies in the late nineteenth century, in the meantime gradually reclaimed into the Portuguese government direct administration, but also documented and appraised a wide range of features related to the colony's cotton production and trade.

Under this scope, collected specimens, photographic records and field notebooks embody a significant part of the BMM's historical and scientific legacy that discloses, for instances, on issues related to selected seeds, recommendations on the choice and use of soils for plantations, accounts on the locations and activities of ginning and pressing factories as well as on scientific research conducted at experimental stations and laboratories established in loco. Moreover, the activity of the BMM, along with its results, might be inscribed in the development plans depicted for the colony, particularly those involving irrigation and transportation infrastructures.

In the extension of the project "Maerua - Motivations and results of the Botanic Mission to Mozambique" (Reference HC/0046/2009), undertake at Instituto de Investigação Científica Tropical (IICT - Tropical Research Institute), financed by Fundação para a Ciência e a Tecnologia (Portugal), this communication will follow the axis of the BMM, also addressing both Portuguese colonial policy and the international scenario. Thus, we hope to contribute to the discussion on the role played by science and technology in the organization of this colonial space, notably on what concerns the ways cotton's production and trade transformed Mozambique's landscape.

S2: Networking the empire

Locality of a Global World – facts and reflects in the Lusitanian land

Ana Paula Silva , CIUHCT, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa

From 1940s to the fall of Salazar's dictatorship (1974), the building process of electricity networks in Portuguese African colonies unveils a truly faith in the transforming capacity of electricity for changing the economic and political situation of the non-developed Iberian country, by means of an effective economic occupation of Angola and Mozambique. It was generally assumed that the electrification of these vast territories would overcome the ultimate frontier to a late but efficient colonial action. The low cost of electricity production and supply would support the installation of white settlers, would increase agricultural production and would promote livestock, as well as would increase the well-being of native populations, including their socio-economic development.

The main obstacle was however to gather resources for undertaking such huge endeavour, namely the needed capital. At start, the state led the initiative by allocating funds for electrification projects in the Developing Plans and supporting the constitution of public capital enterprises to carry out most of the large-scale projects. Despite the significant amount of public funding, it was never considered enough at the eyes of the ambitious actors at stage.

So the controversy between state and private initiative rose and, when the domestic resources were not sufficient, even agreements with foreign countries were negotiated, based on the joint exploitation of natural resource as the international rivers at stake.

This paper analyses these complex and conflicting processes of developmental options based on technical choices by focusing on the above mentioned controversy, highlighting the roles played by the parts involved and the interests enrolled.

Submarine telegraphy as an imperial technology in the second half of the XIXth century (1851-1902)

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keywords: **telegraphy cables imperialism communications**

Submarine cables were a very sophisticated technology in the second half of the XIXth century. In terms of invested capital, financial risk, technological challenge, and public opinion involvement, submarine telegraphy is an extremely important page in the history of the mid 19th century. Taken from the point of view of the economic historian, it appears as one of the events most typically belonging to the second industrial revolution: as a winning combination of science and technology on the one hand, and of entrepreneurial initiative on the other, it fully reflects the leadership of the western world at the time of imperialism. The first really international telecommunications network was created thanks to the cables laid in the depths of the sea: submarine cables are fully included as a privileged component in the debate over the original globalization and establishment of a first global economy at the end of the 19th century. The development of submarine cables was explosive: the 1,100 miles in operation in 1864 became more than 20,000 in 1870, 86,000 in 1880, and well over 200,000 at the turn of the century. There are few more intriguing adventures than the construction of the world submarine telegraphy system: as has been appropriately remarked, the one that most closely approaches it is the laborious conquest of space a century later. The idea of connecting all the continents, making possible within a few hours a contact that a few years previously would have required weeks if not months, seemed incredible even in the eyes of those most sensitive to the progress of technology. It was proof that nature could be subdued by man with intents and purposes that promised to benefit the whole of humanity.

Installation of the cables required long, hard work. Design and construction were not the only complex stages of a submarine connection, it was in fact also necessary to transport the cables, weighing several tons, and lay them - after adequate testing - on a possibly flat, deep sea floor, submerging them with utmost care by means of pulleys. The operation required the use of large ships, expressly built for that purpose, and the participation of expert technicians, mainly research chemists, geologists and engineers. Transmission of electric impulses, subsequently converted into signals, through a cable submerged in deep water was a challenge of a technical and scientific nature highly different from that of overland telegraphy. While the wire of the aerial lines was metal, the conductor of submarine cables had to be encased in special waterproof material, gutta-percha, that would prevent the dispersion of electric power. In order to prevent the cables from suffering damage or, worse still, rupture, they were enclosed in a sheaf of wires, 1 millimeter in diameter each, in order to make them resistant to blows and tension, but also to shellfish, the anchors of ships, and fishermen who were unintentionally responsible for many failures of submarine telegraphy.

S 2

The role of peripheral countries in the construction of the modern global telecommunications system: the case of Spain

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The early emancipation of overseas colonies deprived Spain of capacity and opportunities to play an important role in the global telecommunications system that was built in the 19th century. When telegraph and submarine cables reached his maturity, the vast Spanish colonial empire had been reduced to remains of small entity. Thus, lack of territory to establish communication and economic resources joined to relegate Spain to the role of secondary country. This communication examines how played Spain with the tricks that remained, i.e. how it exploded its geopolitical situation, in acute competition with neighbouring Portugal, and build internal networks in colonial territories that are still preserved. In this task, the theoretical framework drawn up by prominent specialists as Headrick is followed, and primary sources almost unknown so far as well as secondary sources are used.

The deployment of submarine cables on the Brazilian coast.

Mauro Costa da Silva - Colégio Pedro II; Ildeu de Castro Moreira – Federal University of Rio de Janeiro

The electric telegraphy in Brazil starts in the beginning of 1852 when the first electric telegraph line was inaugurated in Rio de Janeiro motivated by the necessity of repression against the slave traffic. During 6 years the lines served only to police, firemen, public affairs and the Emperor, in Rio de Janeiro. Between 1858 and 1864, the few lines were yet restricted to the city, except for a line from Rio to Petrópolis, a small city localized about 50 km from Rio where the Emperor had a cottage. Thenceforth, starting in 1864, the lines went down to South due to the war between Paraguay, in one side, and Brazil, Uruguay and Argentina in the other side. After the end of war, the telegraphic lines grown up from Rio de Janeiro to the northeast of the country, a huge landline along the coastal that connected some important cities of the Northeast of the country, as Salvador and Recife.

In August 1873, the submarine telegraph cable produced in England arrived in Brazil to link Recife, state capital of Pernambuco, to Belém, state capital of Pará. On board of the ship that settled the telegraph cable, was William Thomson (1824-1907) and Fleeming Jenkin (1833-1885), one of the most prominent telegraph cable engineer. The submarine telegraph service between these cities was inaugurated in September 6, 1873. Another cable was installed along the seashore from the Recife to the South until Buenos Aires, Argentina´s capital, and connecting also some cities in Brazil coast. This submarine telegraph service was inaugurated in 1875.

This paper will discuss the beginning of the telegraph submarine service on the Brazilian coastal, controlled by the Western and Brazilian Telegraph Company, and the dispute with the telegraph landline belonging to the Brazilian telegraph office.

S3: Food-production sciences and imperial enterprises

Peripheral metropolises and agrarian landscapes: phosphates and the (re)colonization of Western Sahara

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The recent history of the Western Sahara region is bound to both mining and international power equilibriums. Yet those two rarely come together in historical accounts, which tend to take for granted the interest in resources as the static background for a larger geopolitical game in which colonization, the Cold War, and decolonization are seen as the truly historical processes.

In this paper, on the contrary, I put prospection and mining at the center of this geopolitical story. During the Cold War, the colonial arena in current Morocco and the Sahara pivoted around iron, uranium, phosphates, and even nuclear bomb tests. Looking closely to the research to allocate and the works to extract these resources yields a picture in which the different playing national interests could only be realized through international collaborations and transnational flows of knowledge and materials.

Approaches to colonial and postcolonial sciences are often centered on the distinction metropolis/colony, even when they try to bring into question the alleged one-directional flow of knowledge and technologies. In this story, the dichotomy is broken by the peripheral nature of the metropolises considered (Spain and Morocco), which were competitors and at the same time both of them depended on US and French expertise and military power. Moreover, decolonization of the Western Sahara region meant its de facto (re)colonization by Morocco in the face of opposition by the Polisario guerrilla as well as competing international powers. The Cold War appetite for controlling resources and blocking others to get them allowed Morocco to become the first world producer of phosphates.

Phosphates, which are essential to produce fertilizers enough to feed a post-Green Revolution world, are thus at the center of the changing political and physical landscape of the Western and of the world's agricultural production.

The coffee empire: Portuguese agricultural scientists in colonial Angola (1926-1961)

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Coffee was one of the most important agricultural commodities of the late Portuguese empire, which figured as a key player in the global market. From 1946 onwards Angola was for several years the first exporter among African producers, sharing this position with Uganda and Belgian Congo; in 1974, it was the forth world coffee producer. How was this possible? This paper is about the role of agricultural scientists on Angolan coffee production during a distinctive phase of development of this Portuguese colony: 1926-1961. Coffee has been the object of countless academic studies. Yet, historiography and scientific debates are generally confined to one species, Coffea Arabica. My goal here is to illuminate the hidden story of Coffea canephora, the species growing in Angolan foggy forests, known as the Robusta coffee. I propose to analyse Robusta's breeding experiments and standardization procedures, implemented locally by agricultural scientists of the Agricultural Office of Angola and the Board for Coffee Exportation. As a quest for new biological variability, this is also a story about the circulation of seeds, hybrids and cultivars between empires and across the world.

Histories of co-production: following colonial cocoa and their actors.

Marta Macedo , CIUHCT – Universidade de Lisboa

In the first decade of the twentieth century, British chocolate manufacturers were buying their best cocoa from two small equatorial islands. São Tomé plantations had managed to create industry-suited seeds, adapted to the sophisticated production lines of chocolate powder. However, in England, in these same years, milk chocolate was just being invented. Chocolate bars altered the relation established between the landscapes of large chocolate factories and the landscapes of cocoa producing countries. Manufacturers recognized that in order to make milk chocolate the "milk credentials" became more important than the cocoa ones. This would allow for an inferior grade of cocoa from the peasant fields of the Gold Coast to replace the quality one from São Tomé.

This paper follows a commodity under construction. The goal is not to do a commodity study in the traditional sense, but to understand how science, technology, labour systems and political regimes produced two different colonial cocoas. Paying close attention to the making of the highly technological São Tomé estates in the 1910s and the creation of genetic modified Ghanaian cocoa farms in the 1940s allow us to focus on both the natural environment and the material dimension of scientific practices. By looking at the relation between private and State research, the networks of knowledge circulation, and the role of science and technology in defining labour regimes, the goal of this paper is to show how techno-scientific practices and the social acted together in order to built distinct colonial landscapes.

S4: **Mosquitoes and empires**

The fight against animal trypanosomiasis in 20th century colonial Mozambique

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keywords: *Mozambique, veterinary science, colonialism*

Early on in the 1900s, colonial authorities in Mozambique were confronted with reports of animal trypanosomiasis (animal sleeping sickness), a veterinarian disease responsible for the deteriorating health and eventually the death of domestic animals, in particular livestock. Elsewhere in Africa, research was already under way as to the causes of the disease, methods for diagnosis and cure, as well as to the role of the tsetse fly in the transmission of the disease. With two thirds of the land reportedly infested by the tsetse and with increasing numbers of cases of infected animals, animal trypanosomiasis was gradually considered a problem in Mozambique. The disease was perceived to be partly responsible for elements such as the nutrition and health conditions of the African population, as well as its spatial distribution, key elements for the reproduction of a much sought for labor force. It was also increasingly feared for its effects on the rural economy and on African land use and agricultural and animal husbandry practices. But it also was considered to have a significant impact on the social and economic conditions of the European population and in particular on planned settlement schemes and agricultural projects.

Broadly covering the period between c. 1900 and c. 1950, and following recent influential studies on empire, technology and veterinarian science in Africa, this presentation will detail how animal trypanosomiasis was gradually perceived as a problem by the colonial administration in 20th century Mozambique, the mechanisms that were put forth to investigate the extent of the disease as well as solutions debated and implemented to fight it. It will look at the institutionalization of a veterinarian health department as well as of specific instances designed to fight animal trypanosomiasis. Special attention will be paid to the role of foreign specialists in the investigation on animal trypanosomiasis in Mozambique, the circulation of scientific knowledge in this matter, regional tensions between Mozambique and neighboring territories in the fight against the disease, as well as to how this fight had an impact on African populations. All these topics will be discussed in the context of Portuguese colonialism in Mozambique.

Expertise on tropical medicine in Africa - the missions on trypanosomiasis at the Tropical Medicine Institute (1945-1966)

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keywords: *Trypanosomiasis, missions, Medicine , Africa*

This paper aims to reflect about the expertise on tropical medicine created after the Institute of Tropical Medicine, in Africa, based on the study of permanent medical missions conducted between 1945 and 1966.

The Institute of Tropical Medicine, founded in 1935, following the reorganization of the School of Tropical Medicine of Lisbon, played an important role in the history of public health in the Portuguese colonial context, promoting the emergence of a new scientific area of expertise - the tropical medicine. Since 1946, some of its researchers have integrated some departments of public health and hygiene of the League of Nations, and other health agencies in Africa, as representatives of the Portuguese government. The tropical medicine began to be understood in a social perspective, and Africa was an international priority. The institute followed this international dynamics that could be studied by the permanent missions in colonies.

In this paper we will be analyzed, particularly, the medical missions on trypanosomiasis, an African typical disease, leaded by João Fraga de Azevedo and Fernando Simões da Cruz Ferreira and, since 1945 to 1966.

Finally it is intention of this paper, to evaluate how this expertise conducted to the control of the tropical diseases in Africa and also to the African expertise on tropical medicine, by the establishment of research institutes of tropical medicine, in Angola and Mozambique, shaped on the metropolitan institute.

Francisco Cambournac (1903-1994) and the Expertise on the Study of Metropolitan and Colonial Malaria in Portugal

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keywords: *Malaria, Cambournac, Portugal, Colonies*

This paper intends to analyse the expertise on malaria and the contribution of Francisco Cambournac (1903-1994) to the knowledge and control of this disease in Portugal, both in metropolitan and colonial contexts, from 1931 onwards.

Francisco Cambournac was a doctor and an academic whose professional course was early defined on the fields of malariology, tropical medicine and public health, both in national and international level. He received his background in several national and international institutions such as the Medical School and the School of Tropical Medicine in Lisbon, the Health Organization of the League of Nations, the School of Tropical Medicine in Hamburg, the Pasteur Institute, the London School of Tropical Medicine and Hygiene, amongst many others. In the course of his career, he stood out on the study of malaria in Portugal and in Portuguese colonies.

The study and the subsequent control of malaria in continental Portugal began in 1931 with the foundation of the Estação Experimental de Combate ao Sezonismo de Benavente (Experimental Station for the Combat of Malaria in Benavente), in which Cambournac has joined as an assistant doctor. In 1934, and as a result of the cooperation between the Portuguese Government and the Rockefeller Foundation, another Station was founded, the Estação para o Estudo do Sezonismo de Águas de Moura (Station for the Study of Malaria in Águas de Moura), where Cambournac assumed the position of field director. Later on, in 1938, this station became the Instituto de Malariologia (Institute of Malariology) from which fundamental research on malaria in Portugal was carried out, and where the malariology courses organized by Cambournac took place for training national and international technicians. Francisco Cambournac was the Director of the institution from 1939 to 1954.

In 1942 Cambournac entered the board of professors of the Instituto de Medicina Tropical de Lisboa (IMT) (Institute of tropical medicine of Lisbon), from where he organized, directed and carried out several study and combat missions of malaria in the Portuguese territories of Africa and India, and which would allow the definition of control strategies for malaria in those territories. He became Director of IMT between 1964 and 1973, until his retirement.

Alongside with these activities, Francisco Cambournac became member of the Committee of Malaria Experts of the World Health Organization, where he was elected Regional Director for Africa, for the first time, in 1952, having completed a second mandate.

In this context, we will evaluate the acquired expertise by Francisco Cambournac in the scope of malaria, analysing his background and contribution to the knowledge, study and control of malaria in Portuguese territory.

Negotiating territories and consensuses. Missions to study and fight the sleeping sickness in Portuguese Guinea (1945-1974).

Luis Manuel Neves Costa, University of Coimbra

keywords: SleepingSickness; Guiné; Colonial; medicine.

This paper focuses on the negotiation of territories and consensuses within the hygiene and public health domain in Portuguese Guinea. This is achieved by studying the Missão de Estudo e Combate da Doença do Sono, organised by the Instituto de Medicina Tropical de Lisboa, between 1974 and 1972. An analysis is presented on the different approaches and social, political and scientific entanglements, considering the expertise based on the tropical medicine developed in a metropolitan environment.

In the colonial framework, medicine emerges as an instrumental element, where a connection can be made between colonial occupation and the institutionalization of tropical medicine. The health priorities are clear to the colonial administration, required to obey economic restrictions and strategically insure the defence of the colonial dominion. Portugal used the medical care as a social and political weapon and as a dominance tool.

The Sleeping Sickness is prescribed within the tropical medicine nosology. Several authors see it as a colonial disease. An endemic disease that becomes epidemic with the evolution of the colonial presence. Various descriptions and Medical Reports (Sant'Ana, 1926; Foutoura de Sequeira, 1932), are vital for the diagnostic of the disease in Guinea, leading to the creation of the permanent Missão de Estudo e Combate da Doença do Sono (1945), setting itself as a therapeutic and prophylactic arsenal.

A presentation of this permanent Medical Mission is proposed as it evolved through time, with its significant role in the generation of know-how and medical knowledge, and its integral presence in the legitimisation and assertion of the colonial presence. The knowledge base built around the sleep disease was a significant contribution to the medical and scientific occupation of the Guinean colony.

The Missão do Sono allows foresight into the transfer processes of actors, technology and knowledge from the metropolis to the colony and the generation of new knowledge which transpire from the colony into the metropolis and will end up being of use beyond the scientific motivation. In parallel with the scientific research around this disease, this mission focused on fighting the glossinas (the tsetse fly) and the registration and treatment of sleep disease patients.

S5: Empire in motion

Technologies of identification and documentation of natives in Colonial Mozambique (1897-1960)

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keywords: *Identification, Documents, Colonialism, Mozambique*

"Hard", infrastructural technologies, such as those involved in projecting and operating steamships and railroads, played a crucial role in the building and maintaining of European imperial powers. But other, less conspicuous technological devices were not less important. Our paper will focus on a specific kind of "social technologies" (Cohn and Dirks), such as the systems of identification - passes, identity cards and the "Caderneta Indígena" (Natives' Identification Booklet) - developed by the colonial state in the effort to enforce and legitimate its power, as well as to optimize the control and exploitation of the colonized.

We will present some aspects of our ongoing PhD research on the subject, which aims to lay the grounds for a reconstruction of the genesis of systems and practices for the identification and documentation of the indigenous population in the African Portuguese colonies, with particular reference to Mozambique, between 1897 and 1960. Our concern is not with what we may define as the "ontological" identity of natives, but rather with the concrete procedures by which they were identified by the colonial authorities, focusing on the origins, functioning and purposes of the new identification technologies to which they were subject.

The purposes of mobility control and labour organization of the native workforce led the Colonial State to conceptualize an unprecedented disciplinary apparatus, focused on progressively more sophisticated practices and technologies of identification, which brought to the creation of new types of documents and archives, and ever more complex bureaucratic procedures. This process, characterized by advances and retreats, has been materialized throughout its history by the colonial authorities' imposition of passes, work certificates, metal plates, civil tattoos, identity cards, and, finally, the renowned "Caderneta Indígena". The main sources we employ and analyse in our survey are official legal acts (decrees and ordinances) and reports written by colonial administrators.

S 5

Empire and life: biography as an approach to imperial and colonial science and technology

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keywords: *biography, hydrography, Portuguese empire*

The status of biography in the field of History of Science and Technology (HST) varied significantly throughout the twentieth century. Primordially tied to hagiographic depictions penned by scientists in awe of their predecessors, the sociological turn of the 1960s blamed it as a pointless detour from what really mattered, that is, the wider web of relations in which institutions and individuals are inexorably entangled. In the 1980s biography gained new currency in the field, as some talented historians managed to show that telling one single life can be an optimal way to integrate the individual and the context whilst shedding light on both. Biography in HST has since developed through different, albeit complementary avenues: whereas some biographers take 'life and times' to mean that the 'life' essentially mirrors the 'times', others prefer to focus on the specific dilemmas tackled by those who set out to craft a life in science, engineering or other related activities. This paper seeks to intermediate between these two angles by exploring biography as an approach to imperial and colonial science. It focuses on the life and works of Hugo de Lacerda (1860-1944), a Portuguese Navy officer and hydrographer. Lacerda's life and career developed through a series of appointments in different parts of the former Portuguese empire: Mozambique, S. Tomé and Principe, and Macau. In all of them he was assigned extensive hydrographic surveys, coordinated the upgrade of the local shipping infra-structure, and promoted the foundation or revamping of astronomical and meteorological observatories. Lacerda was thus a pivotal agent in the domestication and economic empowerment of the Portuguese overseas possessions, seeking to fulfill the ambitions fostered in Lisbon with regard to an imperial resurgence of Portugal. But Lacerda was also driven by his own appropriation of Republican values, which he accommodated into a personal ethos grounded on military principles and codes. His life developed at the convergence between a vested imperial agenda and the crafting of an idealized persona: that of a military engineer committed to progress. I will argue that the historical deconstruction of this process will help us build a more nuanced picture of Portuguese imperial ventures in the first half of the twentieth century.

Assembling Tropical Military Barracks: Experimentation, Heterogeneous Engineering and Biopolitics in British Colonial Networks

Jiat-Hwee Chang, National University of Singapore

keywords: *hybridity, heterogeneity, experimentation, biopolitics*

Starting with the exemplary military barracks built in the Changi Cantonment in Colonial Singapore during the 1920s and 1930s as part of the broader effort to turn Singapore into a purportedly impenetrable fortress and "Gibraltar of the East", this paper traces back in time the circulation and translation of knowledge and practices on building tropical military barracks in the British colonial networks from early nineteenth century to early twentieth century. Drawing on previously overlooked archival materials from the Royal Engineers Library in Chatham, this paper examines how barracks specifically designed and built for the tropical conditions first emerged in the West Indies and were subsequently modified in British India and other British colonial territories. This long process of tropicalization, or the translation of metropolitan barracks to the climatic and, more importantly, socio-political conditions of the tropics, produced a building type that was both standardized to ensure uniformity across diverse tropical spaces and sufficiently flexible to accommodate local variations.

There are three main themes in this paper. First, it focuses on how the Royal Engineers - the British military engineers who designed and built most of these barracks - developed diverse bodies of hybrid knowledge to overcome the multifarious difficulties of building in the tropics. These knowledge in fields such as climatology, building construction, sanitation and landscape planning were hybrid as they were substantially influenced by indigenous knowledge and they also relied as much on improvisation as on systematization. Second, this paper uses John Law's concept of "heterogeneous engineering" to explore how the Royal Engineers deployed different strategies to assemble an array of human and non-human agents in order to facilitate the smooth circulation of tropical military barracks within the British colonial networks. Relatedly, this paper also shows how the Royal Engineers used various socio-technical means, such as quantification and other "technologies of distance", to facilitate the building of standardized barracks throughout the British tropical territories. In doing so, this paper hopes to rework the theory of the colony as a laboratory or an "experimental terrain". Finally, this paper understands tropicalization in relation to colonial sanitary reforms and biopolitics. This paper argues that the tropical military cantonment was socio-spatially an exception in a discrepant colonial city. It was a sanitized enclave designed to secure the health and well-being of the British soldiers amidst a larger landscape of contamination in which the "natives" dwelled.

The Jesuit contribution to the development of the Philippine meteorological office

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keywords: *tropical storms, baguios, Manila Observatory, Philippine Weather Bureau*

On the second half of the XIX Century Jesuits made important contributions to the development of earth sciences. Specifically, catalan Jesuits working in the Spanish colonies of Cuba and Philippine islands played a key role in the development of tropical meteorology. They were responsible for important meteorological observatories in Havana, Cuba, and Manila, Philippines. Willing to mitigate the destructive effects of severe tropical storms moved them to study these phenomena. In that way, they contribution to the early understanding of structure and behaviour of tropical cyclones and their forecasting was a bold one. The key names of these developments were Benet Viñes, Frederic Faura and Josep Algué.

Faura and Algué were responsible, for the creation and development of the first Philippine (and Spanish) meteorological Survey. This survey, strongly devoted to tropical storms forecast, showed much more vitality and strength than mainland Spain equivalent. It became a reference institution on the far East. These facts were clearly recognized by the American government when, after assuming the protectorate and administration of Philippine islands after the colonial war of 1898, they confirmed the management of the new Philippine Weather Bureau (intended as a replica of the US Weather Bureau) to the Jesuits of the Manila Observatory and confirmed the direction of Algué.

This "status quo", as a technical office of the state administration managed independently by a religious order, recognized by both colonial powers, Spain and USA, is quite unique and it is a case word to study.

The new Weather Bureau developed as a powerful center under USA ruling, taking responsibility for the weather forecast and meteorological and geophysical studies in a large area of the Pacific Ocean reaching the Marianas Archipelago. This situation continued up to the second world war when, after it, the new Philippine Weather Bureau was directly organized by the independent Philippine government.

This study presents the key figures, Faura and Algué, and facts of these developments, and a first evaluation of the importance of the research and developments made at the Philippine islands.

S6: **Rebuilding empires, engineering nation-states**

S 6

The Rise of the State Technical Corps and the Building of Imperial Technical Regime in Russia

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The technical corps arose from the felt need to settle the activity of a numerous and heterogenous professional group which was that of engineers at the 17th century. Once launched, this form of professional organization turned out effective enough so that a large set of countries would adopte it during the next two centuries. It knew, at first, a rapid extension in the military fields, those of artillery and military engineers. Contrastingly, the technical corps acting independently of the armed forces knew only a moderated expansion with regard to their military counterparts. One find them, however, in most of the European countries: in Spain and in Sweden, in German and Italian States, in Portugal and in France, this former being considered as classic champion of these organizations.

The history of diverse European technical corps seems studied rather well. By contrast, in the Russian historiography this field has been explored in a very sporadic and fragmented way, and this in spite of the fact that the process of "corps' buillding" in the Russian Empire had met a spectacular dynamics during the 18th century. The subject is, doubtlessly, very complicate, both from the factual and methodological points of view.

Aware of all the inherent difficulties, we tempted to meet this problematic by privileging a synthetic aproache which leans on a mass of primary and secondary sources analyzed in a critical way. Our study is focused at the genesis and the evolution of technical corps in Russia during the "big 18th century", a decisive period of their stake in system on the scale of the State. We also want this study to be systematic and contextual. Because we wish, on one hand, to investigate the archetypes of these administrations, elaborated according to the groving experiences and the emerging needs conditioned by both the legacies of past and the synthesis of the imported prototypes, and on the other hand, to inscribe this specific process of administrative creation in a wider sociopolitical and historico-cultural frame. Finally, even if the systematic comparison with the similar European administrations still remains a work to be made, the last researches allow to apply this aproach to some specific scenarios, and our study will take it into account.

S 6

Building for Science, Science for Building: A Critical Architectural History of Building the First University in Istanbul Istanbul in Mid-Nineteenth Century

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Keywords: *Science, Architecture, Discourse, Ottoman*

Building for Science, Science for Building: A Critical Architectural History of Building the First University in Istanbul in Mid-Nineteenth Century

The newly emerging discursive field on science in parallel with the growing interaction with Western European powers is an essential constituent of the rich and dynamic context of cultural and social transformation in the mid-nineteenth century Ottoman Empire. Architecture as a deep-rooted profession and a wide-ranging realm of social practice was not independent of this change taking place within the processes of knowledge production. Thus as a professional discipline related not only with the field of building technology and production, but also with practices of social and cultural reproduction, architecture comprised both material and also discursive processes of this change while offering new visual and spatial organizations to the new scientific institutions of the nineteenth century Ottoman capital. So it is a double-faced yet intriguing question of building for science by means of current architectural practices which were also in transformation due to this expanding discursive field on science.

In this paper I will basically argue that the mid-nineteenth century Ottoman field of architectural practice was very much affected with the prevalent official discourse on the incompetence of domestic know-how in many of the societal fields of production. Thus, I will propose that this was a parallel outcome of the transformation in knowledge practices, because the source of true/scientific knowledge was now considered as "outside." Science here will be considered as a layer of knowledge that is not free of the current power relations from a Foucaltian perspective. Besides, European architects who entered the scene in mid 19th century, started receiving prestigious projects from the Ottoman government. Accordingly, here I propose to elaborate this argument with an exemplary project designed by a European architect according to an ideal Western model for university as an institution of higher scientific education and eventually built in the capital. Therefore, I will attempt to introduce a critical architectural history of the very first university building of the Ottoman Empire, the Darülfünun, as an exemplary case of this argument on the new scientific discourse of mid-nineteenth century Ottoman Empire and the subsequent discursive practices of knowledge for the aim of building for science.

S 6

Agronomic and forestry engineering and the nineteenth century Spanish Empire, 1838-1898: two separate worlds?

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Keywords: *agronomy, engineering, colonies, Spain*

Spain and its overseas provinces and colonies were in the 19th century mainly agricultural societies, although their economic and social organisation was highly different. Despite some relevant differences, colonial policy and metropolitan agrarian policy was framed within the discourse of liberal "fomento", which stressed the need of, at least, an active role of political promotion of technical change in agriculture.

There are some studies on the agronomic and forestry establishments created and developed in the Spanish colonies in the 19th century and a much wider amount of books on agronomy and forestry engineering in the Spanish metropolis. However these spaces have been dealt with separately by national historiographies, in deep contrast with the growing literature that studies the imperial projects for the 18th century. The purpose of this paper is to try and find out: a) the existence or not of a real break between the old and the new imperial scientific projects; b) the personal and institutional links and c) mutual influences between agronomic and forest projects in Cuba, the Philippines and Puerto Rico and those thought out and designed for Spain during the nineteenth century. We would like it to be presented in the session "Rebuilding Empires, Engineering Nation-States: Engineers, Knowledge and the Re-Shaping of Political Landscapes in the Margins of Europe (1700s-1920s)", organised by Irina Gouzévitch (CNRS, Paris), Ana Cardoso de Matos (Universidade de Évora - Cidehus) and Darina Martykánová (CSIC, Madrid).

S 6

Rebuilding empires, engineering nation-states: Knowledge and the Re-shaping of Political Landscapes in the Margins of Europe (1700s-1920s)

Darina Martykanova , CSIC, Madrid, Irina Gouzevitch , Centre Maurice Halbwachs , Ana Cardoso de Matos, CIDEHUS, Universidade de Évora

From the eighteenth century onwards, countries in Europe and beyond underwent radical transformations in understanding and exercising political power, characterized by territorialisation of the state, transformative action directed towards increasing direct control of the territory and promotion of the country's wealth, intervention into the rural and urban landscape and population, etc. These changes shaped the old patrimonial empires as well as the emerging Nation-States and their eventual colonies overseas. Engineers were at the same time tools and agents of governmental action. We maintain that the evolution of the institutions linked to engineering and engineers informs us about the hybrid, conflicting nature of the state-building processes and the emergence of modern governmentality, the multifocal web of power that characterizes modern societies. In our focus on the margins of Europe, we also argue that it would be a mistake to understand the engineering in the old patrimonial empires and in smaller European powers as a simple transfer of technology and know-how from the major centres of knowledge production of that time. In fact, some of the engineering works undertaken represented an unprecedented challenge to the engineers, foreign and local, both in terms of management and technical complexity. Therefore, the engineers working in the margins of Europe and in the colonies produced new knowledge, designed new technical and financial solutions, developed management skills and a capacity of intercultural communication and experimented in new forms of professional sociability.

S7: Colonial spaces in the making

Europeanizing, Civilizing or Exploiting: The Role of Imperial Britain in the Making of Nigeria in the 20th Century.

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Keywords: *Europeanizing, Exploiting, Making Nigeria*

Transport infrastructure plays a critical role in the question of human advancement and in the issue of economic growth and development. Theoretically, the provision of a network of infrastructures serves as a platform for genuine development to take off. Its provision also has the accompanying advantage of shaping the overall economic, political and social landscape of the land by way of transformation in one way or another. Historicizing this phenomenon in the colonial experience of Nigeria will certainly reveal the form and extent of the reshaping of the country by imperial Britain. It will also to a large extent illustrate the advantage or otherwise of the provision of infrastructure in Nigeria by imperial Britain to the country and the people. This will cover the issues of human progress, economic growth and the domestication of transport infrastructure technology. This paper examines the reality as far as the reshaping of colonial landscape in Nigeria was concerned as an outcome of the process of constructing the network of transport infrastructures. The paper submits that, in contradistinction to the theoretical premise that transport infrastructures lead to growth, development and human progress, the reality on the ground, coupled with empirical evidence, present a picture that negates all theoretical postulations. This was because the objective for the provision of the network of infrastructures by the colonial authorities in Nigeria was to facilitate exploitation rather than positively reshaping and transforming the landscape.

Ottoman Engineer, Bureaucrat and their Identity around Electrification of Istanbul (1876-1923)

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Keywords: *Ottoman Empire, electrification, engineer*

This paper focuses on Ottoman engineers and bureaucrats who worked in Istanbul's electrification project in the late 19th and early 20th century with a special focus on their professional, statesman and intellectual identity. The research carried out in the archives of Turkey, Germany and United States will be used throughout the paper.

In order to locate professional, statesman and intellectual identity of Ottoman engineers and bureaucrats during electrification of Istanbul, their ideas and attitudes towards technology, use of knowledge, foreign investment, and modernization of urban infrastructure during the electrification of Istanbul will be analysed in this paper while drawing the standpoint of Ottoman engineer and the bureaucrat towards the larger problematics of the Empire: modernization, industrial and urban development on the eve of First World War and the disintegration of the Empire in 1923.

The analysis of the ideas and attitudes of Ottoman engineers and officials during the fragile years of the Empire form a special base for the identification of their professional, statesman and intellectual identity. The employment of the foreign experts by the State in the electrification project and relationship between the Ottoman engineers and bureaucrats with them will be additional dimension of this paper while identifying the Ottomans employed in the electrification business.

Diplomatic derailing: African transcontinental railways and European politics

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Keywords: *Pink map, Portuguese and British railways*

In this paper I argue that the British Ultimatum to Portugal (1890) is the result of the technology-driven colonial policy of the late nineteenth century. As a response to the new policy of effective occupation established by the Berlin Conference (1885), Portuguese engineers were sent to Africa to start the construction of the first railway lines both in Angola and Mozambique. The purpose was eventually to link the two main Portuguese colonies from Luanda to Lourenco Marques, the so-called Pink Map. However, this project clashed Cecil Rhodes's Cape to Cairo railway line, thus opening a period of strong tensions between Portugal and Great Britain which culminated with the 1890 British ultimatum.

The Berlin Conference rationale favoured aggressive territorial policies such as the ones led by Disraeli and Cecil Rhodes for the British Empire, by Leopold II of Belgium over Congo, by France towards their African colonies and by Bismarck's colonial expansion, and clearly threatened Portuguese historical rights. Portugal, a peripheral country in Europe, was suddenly aware that its presence in Angola and Mozambique had to become much more visible. Technical infrastructures, mostly civil engineering works, were the natural choice to show the great European powers that Portugal was indeed able to master its African empire.

The Portuguese coast to coast railway project was, however, a too daring movement in the African table chess, unleashing Rhodes' fury and leading Portugal and Great Britain to one of the most critical diplomatic events between the two nations.

Shaping the Revolutionary World: Colonial Expertise Translated and Re-Born in Post-Colonial Egypt

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Keywords: *Expertise; development; (post-) colonial; Egyptology*

What happened to expertise gained in the colonial world once the colonial world ceased to exist? What meaning did that expertise have once the world where it was developed began to change? This paper argues that expertise developed through colonial scientific practices not only fuelled professional careers in the European world. Once explicit European colonial domination began to fade, colonial scientific expertise was crucial in the maintenance of the European (and North American) ability to shape areas of the world that had once been subject to that domination, even when that end was unintended. Whilst this argument is hardly ground-breaking, this paper demonstrates that it also applies in unexpected contexts. For example, in the dust kicked up by archaeological excavation, colonial expertise was materially involved in shaping the post-colony and its contingent political realities.

This paper takes Egypt as a case study. As the 1952 Free Officers' Coup slowly became represented as a Revolution, professional knowledge of Egypt's ancient past began to take on a new role. Adhering to contemporary universals of political-economy, Egypt's new leaders decided that a revolutionary Egyptian modernity was to be constructed with the aid of a phalanx of (often foreign) technical experts, and Egyptological work appears to have been translated into the increasingly powerful technocratic idiom that resulted. Development discourse propelled the 'expert' institutions and actors of the Western world into shaping the lives and physical realities of those countries, such as Egypt, deemed as under-developed. Egyptological institutions and actors, whose expertise was based upon colonial interactions with Egypt, were a part of that process.

This paper examines how this process was put into practice. To do so, it uses one particular piece of Egyptological work as an example. The collaborative excavations of the University of Pennsylvania Museum of Archaeology and Anthropology and the Egyptian Department of Antiquities at the site of Mit Rahineh, near Cairo, from 1954-1956, were not long-lived. However, their existence illustrates how colonial Egyptological expertise was both translated into the terms of, and also helped to create, post-colonial realities. Circulating between the poles of US and Egyptian government policy, the excavations were an opportunity for Western Egyptologists to continue their work in the country. They also allowed their Egyptian counterparts to cement their own position in revolutionary social hierarchies. The translation of colonial expertise into a discourse linked to contemporary political practice was, then, a transformative experience, and not simply in terms of the ground that was excavated. This paper illustrates how, and demonstrates the breadth of the role of colonial scientific practice in shaping the twentieth century world.

S8: **Housing experiments**

S 8

Post-Colonial Careering: Colonial Administrators and the Management of Post-War British New Towns

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Keywords: *decolonisation, administration, New Towns*

This paper explores notions and practices of colonial expertise and professional status in decolonisation. We focus on the administration of British Mark 1 New Towns (designated between 1946 and 1950). New Towns were large-scale experiments in modern town planning in England, Wales and Scotland. They emerged from an acute need to respond to a housing crisis, and a shift towards a welfare state in post-war Britain. It has, however, been largely overlooked that the New Towns took shape against a backdrop of demobilisation and decolonisation of the British Empire. As a result, many of those involved in administering these new towns were building on careers forged abroad, often in colonial service.

In this paper, rather than focus on architectural or town planning expertise and its circulation through and between colonial sites, we hone in on the technologies of town management and administration. In particular, on a movement of personnel, ideas and experience from colony to decolonising imperial power. Via the examination of individuals who made this transition from colonial to New Town administration, we explore how techniques, technologies, and knowledges learnt or practiced in a colonial context were transferred into these new spaces of socio-political experimentation in Britain.

The paper highlights the ways in which these new urban landscapes were configured in relation to experiences, practices and expertise developed in colonial service. We suggest that exploring "post-colonial careering" among professionals and experts moving from colonial service to New Town administrations opens up a space to examine the social and epistemological status of the colonial expert in decolonisation.

The prefabricated building Processess in the Tunisian reconstruction

Nesrine Azizi, Tunisia

Keywords: *Prefabricated Building Process*

The Tunisian reconstruction under the French Empire after the 2nd World war was slowed down considerably by the shortage of building materials, the sparsity of the resources and by long delays in the construction. The reconstruction's administration already carried out in the large-scale planning, and an intensification of the constructions, owed to deal with this rehousing problem by ensuring a production of houses in great quantities while seeking to reduce costs and delays. Taking advantage of the general context of industrialization of buildings, the Tunisian administration had launched in 1946 a seeking of the use of new methods of prefabrication which respect the local conditions of the Tunisian regency. Of course, that reduced costs and delays. Among the processes retained by the administration, two are the most interesting: the fisrt one is the vuillemin process which carries the name of its inventor actually the enginner michel Vuillemin and the second one is the process of Mattei refering to its inventor as well Noel mattei . We suggest in this study, which studies both processes invented by these two engineers in the regency of Tunis, that in the case of the engineer Matei it allowed him later to use these processes of prefébarication on France and in the USA." in fact, few studies have examined the expereinces of prefabrication contruction that were introduced in tunisia at time reconstruction of the country, the reason why we are looking through this study, in attempt, to fill the lack of knowledge about the differents essays of the construction industrialization during this period and this will be based on the archives of the department of architecture and town planning managed by the architect B.Zehrfuss

S 8

Following engineers and architects through slums: history and present of the technoscience of slum intervention in the Portuguese-speaking landscape

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Keywords: *postcolonial urbanism; slum rehabilitation*

This presentation draws on an enlarged view of the history of state intervention in informal settlements and poor built environments throughout the 20th century, in cities such as Lisbon, Porto, Luanda, Maputo or Macao, in a multi-sited emergence of a technoscience of housing; as well as on ethnographic research with experts from the National Laboratory of Civil Engineering (LNEC) during the scientific assessment of informal dwellings in the neighbourhood of Cova da Moura, Lisbon, made with a view to rehabilitate them (2008-present); to discuss how the socio-technical complexities of slum intervention are a clear indicator of the value urban poor populations have for different political regimes.

First, by pulling the thread of colonial expertises of urban control/negligence to the present-day situation of informal settlements such as Bairro da Ilha Verde (Macau), parts of the Caniço (Maputo) and some musseques (Luanda) I seek to better understand urban innovations regarding these settlements. Then, in the case of Cova da Moura I show that at the centre of the complex arrangements between engineering, architectural and social knowledge lays the will of the central government and municipal authorities to grant the population of the settlement their 'right to the city' - in the sense of the in situ rehabilitation of substandard dwellings instead of displacement. Using insights from STS applied to the built environment (Gieryn 2002, Jacobs 2006, Hommels 2009), I show how the current 'unbuilding' and 'reconfiguration' of the dwellings in Cova da Moura not only is based on the adaptation of scientific knowledge from formal housing, (namely through a 'laboratorisation' of the dwelling); but that it is dependent on the intense, subjective-objective and embodied experience of the experts that evaluate the dwellings; i.e. it is dependent on people as scientific instruments (Derksen 2010).

S9: Infra-structures and colonial engineering

Shaping landscapes and building expertise: the role of the Baro-Kano railway in the making of imperial dream

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Keywords: *Technology, railway, expertise, Kano*

Among the many important developments of the late nineteenth and early twentieth centuries, two were of momentous and transformative consequences on Africa. One was the construction of railway technology, and the other was the eventual inauguration of the railways and its associated consequences. Historians have commented extensively on these issues; but they rarely comments on the difficulties and challenges of domesticating railway technology in tropical latitude; the perception as well as reactions of Africans towards railway technology. Although quite a body of literature exists on perception and expectations of the colonial authorities about the railways, there is still a gap in our knowledge concerning how the colonies supported the circulation of experts and expertise between Europe and the colonies and between colonial powers. Where these are considered in mainstream literature, it is often in passing remarks. In this paper, I will focus on the early moment when railway technology was first introduced in Northern Nigeria, focusing on the challenges faced by British in adapting the railway, and how the British surmounted the challenges by mobilizing human and materials resources, including the establishment of a technological department to support the circulation and adaptation of railway technology in the region. This paper argues that, as with many imperial technologies, the railway was a vehicle of imperialism-build to satisfy British insatiable appetite for cotton. Unfortunately, the colonial authorities were disappointed at the surprising and unexpected results of the railway. It argued also that Nigerians perceived the railway technology with a mixture of fear, shock and wonder. Finally, it argues that in spite the challenges; scarcity of resources and criticisms; the transfer of this technology was a grand success, resulting as it did in providing a training ground for colonial corps of experts and Nigerians.

S 9

The Mormugão railway in Portuguese India: political context and technical difficulties (1878-1902)

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Keywords: *Railways Mormugão Goa*

In the late 1870's, Portugal turned a more concerned attention to its overseas domains. In India, Goa had become a burden to the Portuguese exchequer. However, there was a strong emotional commitment between Portugal and Goa and furthermore there was still the hope that Goa could once again flourish and become an active part of the Empire.

A railway could be the answer to these expectations. After a rather complicated political negotiation with Britain and British India, and some parliamentary discussion in Portugal, an English company was hired to build a railway connection between the port of Mormugão (also known as Marmagão or Marmagoa in some sources) and the frontier with British India.

It was decided that this railway would use narrow gauge, even though this went against the better judgment of the engineers who surveyed it. However, the hilliness of the region (namely the Western Ghats mountain range) and the need to save money determined that a metric gauge was to be used.

In this paper we aim to analyze what technological challenges were faced by the engineers who built it, how much did it cost and what were the consequences of the investment over the general economic situation of Goa. We aim to determine whether the Mormugão railway was an example of technological frontiers that the prominent American historian of technology, Thomas Hughes, defined as "wherever and whenever nature in her nonanimal manifestations frustrates man in the pursuit of his objectives, there exists a technological frontier. To penetrate the frontier man must develop techniques or a technology allowing him to adapt to, modify, or obliterate nature". Put another way, was the construction of the line a demanding but known challenge or did it present the supervising engineers with a novel technological frontier that required significant practical and/or theoretical innovation?

We will do so, bearing in mind the political context in Portugal at the time and also the theories about the application of narrow gauge in ridged territories.

To achieve these goals, we will use Portuguese and British sources of information (the track was set and exploited by a British company, but it was supervised by the Portuguese authorities), namely reports of the engineers who were supervising the works and the Portuguese parliamentary debates, but also the company's reports and official letters of the Portuguese authorities.

This paper is a further development of a previous one written by the same authors and presented a few weeks ago in a conference about the Portuguese Tua narrow gauge line. It is also intended to be the first stage of a larger investigation project about the establishment of railways in Portuguese former colonies. Thus, suggestions, advices and criticisms are more than welcome.

Moving across the empire: Analyzing the local Public Works Departments technical boards in the oriental provinces.

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Keywords: *experts, circulation, public works*

Local Public Works Departments were established for the first time, with a similar structure, in all the Portuguese colonial space in 1869. They played a central role in the development of the territories and created the institutional framework for different manifestations of mobility connecting metropolis and colonies, transposing empires, through the circulation of people, ideas and technology.

This paper will try to understand the circulation of experts within this administrative colonial institution from 1869 to 1910. To do so, it will reconstruct the technical boards of the Public Works Departments of the former Portuguese oriental provinces (Goa, Mozambique, Macau and Timor) and follow the colonial carriers of the different technicians, mainly engineers and conductors.

Dividing the analyses made in two distinctive periods (1869-1892 and 1892-1910) it will examine if the 1892 reforms, made in the colonial administrative organization, brought variations in this circulations. However it will particularly attempt to comprehend if there were particular circuits and networks in these circulations.

Exploring the inside structure of a local administrative institution it aims to be a contribution to the comprehension of the importance and dynamics of local Public Works Departments within the Portuguese empire and of the colonial carriers of its experts.

Luanda-Ambaca: the first inland railway in the Portuguese colony of Angola

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On 31 October 1886 the official launch ceremony was held for the Luanda-Ambaca railway, the first inland railway that the Portuguese state planned in its vast overseas space. It was the culmination of a long process of reorganization of the Portuguese colonial empire, marked out between the independence of Brazil and the defining of an agenda for the promotion of the African provinces, due to the urgent necessity to promote effective occupation of those territories, just as they had been imposed, by the major European powers at the 1885 Berlin Conference.

To politicians and especially the professional class of Portuguese engineers, the railway emerged as a prodigious symbol of modernity and development, an indispensable tool for strategic territorial ownership (of a region where lines of communication were practically inexistent). It was as well directed to its population, a systematic implementation of the Portuguese state's administrative machinery, economic use of natural resources – in domestic and foreign trade – agricultural and industrial revitalization and, above all, the affirmation of Portugal (a small country in peripheral Europe, but in the political center in extensive colonial rule) in the community of nations that disputed influence and power in Africa.

The first stretch, with a distance of 45 km linking Luanda to Funda, was open to exploitation on 1 November 1888. The connection to Ambaca appeared to be, in the spirit of its ambitious mentors, the first stage (353 km) of a more extensive project, whose ultimate goal would be the link to the opposite shore of the continent in Mozambique, in the Zambezi region. Its conception and implementation, in the virginal landscape of the overseas province, marked the first moment a set of practical and technical knowledge of Portuguese engineering was transmitted, knowledge which essentially resulted from the experience accumulated until that moment in the construction of railways in Portugal. There is no other way to explain the adoption of the narrow gauge (1m gauge, widely used in Portugal and throughout most of Europe), while in Africa, the norm was the use of 1.067m gauge (which would incidentally come to be known as the "African gauge").

In our communication we will conduct a detailed analysis of all the political, economic, health and technical specificities that were involved in the planning and construction process of the Luanda-Ambaca railway, here understood as the true "tool of the Portuguese empire", looking, whenever possible, to link the construction methods employed in similar projects in Portugal. We will look in particularly to the recognition of the solutions found to overcome a set of technical difficulties associated with the railway sections where terrain accidents were more common, namely the rugged mountainous area in the Cazenga mountain range (including the municipalities of Zenza to Golungo and Golungo Alto, as well as Massangano and Cazengo), in the route from Quisanga to the Luinha Valley.

S10: **Mapping borders**

Erasing Ambiguity from the Map: the Sino-Burmese Border Dispute, 1892-94

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Keywords: *border demarcation; imperial cartography*

In the early 1890s, Qing China and Great Britain engaged in negotiations to demarcate a boundary between Yunnan province and British Burma. Drawing a line that neatly divided this mountainous frontier between the Qing and the newly-arrived British posed a unique set of challenges, given the region's long-standing tradition of indirect rule and the practice of local tribes to pledge allegiance to both the Burmese and Qing courts. These efforts were further complicated by distinct perceptions of space and mapping traditions among the Qing and British negotiators. This paper examines how the demarcation process prompted a shift in the manner the Qing employed maps and gazetteers to document their territorial possessions and construct geographical knowledge. By analyzing this process of border demarcation, this paper engages in cross-regional and comparative approaches to surveying and cartography. I examine mapping and geography in relation to colonial expansion and state formation, drawing on scholarship that has redefined maps as "texts" in empire-building. Using recently declassified nineteenth-century maps, diplomatic dispatches and travel diaries from archives in China, Taiwan and Great Britain, I argue that the Qing negotiators in London formulated a unique spatial discourse by reinterpreting traditional notions of sovereignty while at the same time drawing on concepts international law. I show that the Qing viewed fixing a boundary not only as a means to curb foreign encroachment, but especially as an opportunity to extend their administrative and military influence over Southeast Asia. Finally, I discuss how the signing of Sino-Burmese border treaty in 1894 changed the way that provincial and local authorities mapped, defined and enforced sovereignty along the border regions.

Mozambique borders in the late 19th century: between colonial imposition and scientific performance

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Keywords: *Mozambique, borders, science, impacts*

By using the documents produced by the different Portuguese commissions involved in Mozambique border process in the late 19th century, we intend to show the relevance of approaching the process of implementation of the borders considering not only the colonial policy and the consequences of the colonial disputes in the area, but also a perspective combining scientific and environmental impacts. For this purpose, four operating assumptions will underlie the way we will approach this subject:

1st Considering the nature of the works to be done, the border process was an incentive to the recognition and effective knowledge of the territory. The fieldworks provided the identification and description of wide areas and people previously unknown;

2nd Mapping the territory compelled the use of accurate instruments and techniques and the presence of experts in using them. The difficult conditions of the field work in Africa imposed specific adaptations of the scientific instruments commonly used in order to preserve their accuracy. The new areas became an experiment campus for the new techniques and scientific equipments that were then used and enabled the scientific cartographic and geodetic coverage of all the country;

3rd By giving detailed description on the region the reports of these commissions inform on regional features - land, geography, climate, landscape, ecosystems, natural resources. - as well as on the political, social and economic situation. In many cases, these are the first descriptions providing unique information on wide areas allowing a better perception of the region, its evolution and changes;

4th The physical implementation of the borders had a severe impact on landscape and land use affecting directly the daily life of the indigenous communities while forcing local and regional social and economic readjustments.

Considering these 4 different aspects we also expect to illicit discussion around the way scientific knowledge was used in Africa to produce a consistent and relevant corpus of documents, some of them still in use today, as is the case of the technical documents regarding the geodetic network or the location and coordinates of the different boundary marks.

The Colonizer in the Computer: The British Influence in Palestinian Authority Cartography, 1993-2000

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Keywords: *Palestine, Maps, Colonialism, Mobility*

In this paper, I argue that the legacy of British colonialism and the ongoing Israeli occupation combine to shape the content of Palestinian Authority maps. Although transnational flows and the related spread of computer technology are often viewed positively (Kearney 1995), in this case the presence of non-Palestinians has restricted Palestinian mobility in the landscape (Aouragh 2011; Weizman 2007; Zureik 2011), encouraging international travel while confining local movement to select population centers. As a result, dominant forms of knowledge (Edney 1997; Winichakul 1994) have come to be reproduced through the use of Geographic Information Systems (GIS) mapping software. This in turn has helped to foreclose alternative methodologies, thereby intricately shaping Palestinian Authority efforts to create urban plans for their nascent territory.

Palestine and Israel have long been the site of intensive mapmaking (Gavish 2005), but Palestinian-led cartography only began in earnest following the 1993 Oslo Accords and the division of the West Bank into a patchwork of islands of limited Palestinian control. During the years that followed, the Palestinian Authority increasingly depicting the West Bank as one continuous territory even though a proliferation of Israeli checkpoints prevented them from personally visiting many of the areas that they sought to map.

In recent years, restrictions continue to limit their ability to conduct aerial and ground surveys to collect original data. This has encouraged the Palestinians to make extensive use of existing maps, including the results of nearly 100 year-old British colonial surveys. British maps themselves have a high degree of stability (Gavish 2005), as they have been actively preserved even as thousands of villages were destroyed over decades of conflict (Falah 1996; Khalidi and Elmusa 1992). The use of these colonial maps has led Palestinian Authority cartographers to focus upon developing hard boundaries and quantitative methodologies. This results in a privileging of economic value of the land over alternative forms of value, and the continued erasure of specific rural areas, thereby helping to reshape the very landscapes which have so influenced their maps.

Through an analysis of the influence of these British maps upon a project to develop digital maps within the emerging Palestinian state, I thereby seek to better understand how colonial forms of knowledge have impacted the use of computer technology to study and analyze the landscape of the West Bank. I use semi-structured interviews and participant-observation at the Palestinian Authority Ministry of Planning to investigate why, paradoxically, Palestinian cartographers have sought to end the Israeli Occupation by using the very colonial maps which may have contributed to the conflict in the first place.

Siberia: Inner Colony or New Heartland of Russia: A Role of S&T in Changing Siberian Image and Self-Identification

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Keywords: *Siberia, inner colony, technology*

For centuries Siberia was developing in a semi-colonial way. It was considered as a resource base of Russia, a place for exile, interests of ethnic groups were not properly considered, it was lagging behind in terms of industrial and cultural capacities, etc.

There were long-lasting debates in public opinion on whether Siberian development strategy corresponds to those of the oversees colonies of the European countries, and Siberia should have been considered an inner colony of the Russian Empire and later the Soviet Union? In the middle of the 19th century the situation in Siberia was conceptualized by Nikolay Yadrintsev in his "Siberia as a Colony in Geographical, Ethnographic and Historical Respects". He, together with Grirориy Potanin became the leaders of so called Siberian Regionalists movement. It laid the ground for the Siberian self-identification based on the opposition to the Russian capitals St. Petersburg and Moscow. One of the arguments was the fact that Siberia did not possess a developed system of science, technology and higher education working for the interests of the region. Scientific investigations of Siberia were arranged on the basis of the expeditions models. However, at the end of the 19th century an Imperial university was founded in Tomsk and foundation of the Tomsk Technical University followed shortly. Surprisingly enough, at least partially it resulted of the forced resettling of intellectuals who were not loyal to the authorities that further strengthened Siberian self-identification. In the meantime setting up the universities became a factor of making Siberia and European parts of Russia closer in intellectual respects.

In the Soviet epoch massive technology transfer was arranged from the Western part of the country to the East. It was supplemented by setting up the regional system of S&T institutions. The major breakthrough occurred, however, in late 1950s and 1960s when huge network of academic research and technological institutions was organized in the region. Formally it changed the profile of the region and impacted its image also contributed to undermining perception of Siberia as a colony. However, as Siberian economy was based on exporting row materials, mostly oil and gas opened up also in 1960s that despite R&D and S&T systems was not counter-balanced by the hi-tech industries, there were still arguments remaining for considering development strategy of Siberia as a colonial-type one. The issue remains appropriate now, after repositioning Russia as the emerging market economy. In the official doctrine Siberia is now positioned as a new Russian heartland. Meanwhile, judging on the historical experience, the dichotomy of the inner colony approach and/ or new heartland vision does not have clear answer so far and remains disputable at the moment. The paper that is based on the data from archives and analyses of Russian historiography is going to address this dichotomy in historical retrospective of 19th and 20th centuries through the prism of the S&T factors impacting the development strategies of Siberia in the past and till nowadays.