ERC Consolidator Grant 2015
Research proposal [Part B1]

Networks Across Oceania

Studying the impacts of the earliest European presence in the Western Pacific, 16th-17th centuries AD

NAO[1]

Cover Page:

-	Name of the Principal Investigator (PI):	María Cruz Berrocal
-	Name of the PI's host institution for the project	Universität Konstanz
-	Proposal duration in months	60

This multidisciplinary project investigates the impacts on native societies of the earliest European presence in the Western Pacific during the 16th-17th centuries, both through direct contact and its repercussions, and the indirect consequences caused by the introduction of new species into the local environments. The project will 1) study for the first time all documentary sources pertinent to the early European presence in the Pacific; 2) study direct contacts in two extremely well-suited archaeological case studies, Taiwan and Alofi, paying attention to two European commensal species: pathogens and sweet potato; 3) study indirect contacts using Network Analysis for constructing models of the spread of these species; 4) integrate data in an Information System to create innovative analytical capacity and a tool for publication.

Although not exclusive, the special focus of NAO on bioecological aspects is due to their material long-term effects, that can be detected in the record. Besides, mounting evidence shows that the Pacific was an interconnected region in which short- and long-distance navigation played a key role. In this context, any impact on any part of the network should have a subsequent impact in it, a conceptualization that provides a unique way forward to develop an understanding of European influences: they will not be analysed as an aggregate of disconnected events (expeditions, failed/successful colonization attempts), but through the underlying patterns of connectedness. NAO addresses the transformation of events into historical processes of cultural transformation through the action of the local peoples, focusing on the ecological and cultural aspects significant for understanding social and ecological long-term changes caused by the earliest European presence in the Pacific.

This project is the first systematic study of the consequences of the earliest European presence in the Pacific, and challenges traditional views on the history of the region.

[1] NAO is a generic Spanish name for ships. It is also the name of a particular type of ship used for exploration by the Iberians during the 16th and 17th centuries. The name NAO signals the vectors that made the Pacific a network of places before and after the 16th century.

Section a: ***Extended Synopsis of the scientific proposal (max. 5 pages)***

State-of-the-art

Traditional historiography considers the 18th century as the time of the first relevant European presence in the Pacific. It has overlooked the existence and extent of earlier encounters between indigenous populations and Europeans in the 16th and 17th centuries. This multidisciplinary project investigates the impacts of this earlier European presence on local societies: not only direct contacts were established, but also indirect effects, mainly caused by the introduction of new species into the local environments, did shape the history of the region. Both direct and indirect relations will be analysed combining the study of written sources, archaeology, bioecological research, and Network Analysis, to address this question: which were the consequences for local peoples of the European direct and indirect contacts in the Western Pacific in the 16th and 17th centuries?

The Pacific has not only received European influences since very early on; it has also made particular contributions to world history. It was one of the last areas to be settled by humans, and also to be incorporated into the Western colonial worldview, mainly through J. Cook's voyages. From the late 18th century Europe has been fascinated by the discovery and exploration of the South Seas, and the Pacific has been important in the formation of European modern science, literature and art (Boulay 2005). In this region, social-environmental coevolution has had a particular trajectory due to its island geography, and social contact and interaction can be better observed. Historical and anthropological studies on Oceania have flourished for centuries now, and basic notions on social organization have been extracted from the region and elaborated by philosophers (J. Rousseau) and anthropologists (M. Mauss, B. Malinowski, I. Goldmann, and M. Sahlins). Ultimately, these theoretical/empirical constructions have been extrapolated to other historical and geographical contexts, and in particular European prehistoric contexts have been often interpreted in Pacific terms. On the one hand, this demonstrates the relevance of deepening our understanding of Pacific history. On the other hand, the traditional historiography which connects the Pacific encounter solely with Cook neglects the scope and impact of earlier European encounters with the indigenous societies of the Pacific Islands, thus working on the basis of an incomplete image.

Early European expeditions into the Pacific undertaken by Dutch, Portuguese and especially Spanish ships and fleets (starting in 1519) in the 16th and 17th centuries are numerous (only the Spanish voyages number seventeen until 1606) and include voyages such as Ortiz de Retes' in 1545 to Papua New Guinea (PNG), to Massim (PNG) in 1606, or the crossing of the Pacific by the Dutch W. Schouten and J. Le Maire, among others, that have so far remained largely invisible for research. These expeditions involved the foundation of colonies in the Philippines, Taiwan and Marianas, and failed attempts in Graciosa Bay, Santa Cruz island (Solomons) led by A. de Mendaña (in 1595-1596, after attempts in 1567-1569) and in Vanuatu by P. Fernández de Quirós (1605-1606). The launching of the Manila Galleon in 1565, which made two transoceanic journeys every year, is also a most important factor that led to many potential situations of contact, since the Galleon was an experimental endeavour during the first half of its life, and explored different routes looking for watering and provisioning islands.

However, archaeological investigation on the consequences of these events for local populations has been scarce and preliminary (Allen and Green 1972; Dickinson and Green 1973; Green 1973; Allen 1976; Bedford et al. 2009; Gibbs 2015), with the result that an important part of history remains hidden for Pacific communities and Europeans alike. This project contends that the thorough study of these European endeavours and the response from native peoples, never undertaken yet, will change current perspectives on the history of the Western Pacific by showing that the consequences of direct and indirect contact in the 16th and 17th centuries were more profound and widespread than has been anticipated.

Objectives

The project will reshape the history of the European-Pacific encounter in its early stages by 1) bringing together, for the first time, all documentary sources pertinent to the early European presence in the Pacific, 2) studying direct contacts through two particularly well-suited archaeological case studies: Taiwan and Alofi (Wallis and Futuna), and paying attention to two species commensal to the Europeans and foreign to the Pacific: sweet potato and pathogens, 3) studying indirect contacts using the emerging field of Network Analysis (Brandes et al. 2013) for creating empirical/theoretical models of the introduction and spread of those species, 4) combining data sources in an Information System with visualization and analytical capacity. This combination of goals will be unfolded in the Western Pacific, broadly defined as the area west from

Tonga -a region that comprises the main scenario in which European activities can be studied at this stage- to investigate NAO's research question: what were the consequences of the European endeavours in the Pacific in the 16th and 17th centuries?

Assumptions

The project will ensure results by focusing on two cases recently researched and partly excavated by us, Taiwan and Alofi, particular good examples to study different forms of short- and long-term direct contact. Our fieldwork will pay attention to every possible aspect of the record, with an emphasis on the introduction of new species as seen in: 1) vegetation changes in the 16th-17th centuries; 2) changes in land use and 3) study of burials and human remains, as markers of demographic changes. NAO is a first step in the direction of applying an ecologically-based archaeological perspective to the study of the important topic of European impacts in the Pacific and its repercussions, paying attention to bioecological traces because they do have long-term effects, in particular those created by the direct and indirect introduction into the local environments of new species: sweet potato and pathogens. A) Sweet potato is a very significant element in Pacific archaeology due to the different potential scenarios for its introduction into the Western Pacific, namely a) introduction by Polynesian voyagers in an indeterminate moment in prehistory; b) introduction by the Portuguese and Spanish in the 16th-17th centuries into Indonesia, Philippines, Solomon, Vanuatu; c) introduction starting in the early 1800s as e.g. in Allen (2005). Different lines of evidence converge to point to the European introduction in the 16th-17th centuries. B) Pathogens, or virgin soil epidemics caused by them, are a topic with huge implications in current political issues, Pacific archaeology, and island history (see Kirch and Rallu 2007). Although the effects of virgin soil epidemics have been studied for the period after Cook's journeys (see Crosby 1986), the same kind of interaction, or even longer and more intense, during the 16th-17th centuries, has not received the same consideration yet.

Although these species were probably not directly introduced everywhere by Europeans, an impact on most islands is predictable because mounting evidence shows the region as dynamically interconnected, where short- and long-distance navigation played an important role. After a breakdown of the Lapita networks created during the first settlement, archaeology and ethnohistory show a recomposition of these networks in the centuries preceding European presence (see influential contacts among Vanuatu, Fiji, New Caledonia, and the Solomon Islands, among others, in e.g. Spriggs 1997; Bedford 2006; Sand et al. 2007; Bedford and Spriggs 2008; Flexner et al. 2015). In this context, any impact effected on any part of this network should have a subsequent impact on the rest of the network, and therefore Network Analysis and modelling provides a unique way forward to develop an understanding of European influences. The project therefore tackles the transformation of events into patterned processes of connectedness through the action of local peoples. The elaboration of models will track the spread of sweet potato and pathogens in the region, which seem to have happened mostly without direct European intervention, thus visibilizing even the indirect long-term impacts caused by the earliest European presence in the Western Pacific.

Research Strategies (RS) and methodology

The project will create a synergy in the combination of 4 Research Strategies: RS 1) systematic research of documentary sources pertinent to the early European presence in the Pacific, RS 2) characterization of direct contact through archaeological fieldwork, RS 3) characterization of impacts caused by indirect contact through the creation of empirical/theoretical models, RS 4) elaboration of an Information System to integrate large amounts of heterogeneous data, perform analysis, and provide universal access to our information.

RS 1) Systematic research of documentary sources pertinent to the early European presence in the Pacific

Historical documents have not been sufficiently studied to extract information about the local people and the early contact. They hold, however, a wealth of information that must be exploited from a multidisciplinary perspective to show the scope and potentially significant effects of European presence in the 16th-17th centuries. This project will create a corpus of documentary data from Spanish, Portuguese and Dutch primary sources, first, to fix the scope of their activities, and second, to gather information about native populations. We will systematically analyze Spanish, Portuguese and Dutch documents from a selected, well-chosen set of archives in Spain, Mexico, Portugal, and Holland, dating to between 1519 (initial voyage by Magallanes) and 1662 (end of the European colonies in Taiwan). They include 1) chronicles and diaries, 2) log books, 3) maps, 4) edited sources. The goals, never addressed before, include: a) organization of a cartographic repertoire of each expedition; b) revision of the ship routes; c) systematization and analysis of ethnographic information. Regarding the study of sweet potato, NAO will analyze Spanish written documents of voyages and cargos in every expedition and colonization attempts to find mentions to it and evaluate methods of

propagation from America. As for pathogens and disease vectors, historical documents will be used to assess the health state of the Iberian and Dutch ship crews, and the consequences grasped by chroniclers, not uncommon, about the spread of diseases.

Documents will be coded using qualitative data analysis with categories such as a) navigation routes, potential places where visual or real contact may have been established, colonies founded; b) plant and animal species in cargos, methods of transportation; c) health of the crew; d) estimates of native populations; e) reactions of natives to contact, oral history; f) objects of exchange, theft, smuggling; g) environmental aspects; h) climatology and natural disasters; i) navigation techniques; j) social organization of natives, gender roles, changes during the contact period; k) existence of linguae francae, social roles of language.

Feasibility: Most repositories have been preliminarily researched by the PI and other team members, so we have a clear idea of the task and access has been secured. Results are in progress and will be included in the Information System at an early stage of this research. The qualitative data analysis has already been implemented by the applicant with documents about Taiwan and Batanes, pertinent to this research.

RS 2) Characterization of direct contact through archaeological fieldwork

The study of direct contact and interaction is better achieved through archaeology. Two case studies, Taiwan and Alofi (Wallis and Futuna), have already been researched by us and constitute perfect settings for the task. In both, contact between natives and Europeans is perfectly attested and produced material consequences that can be studied through archaeology. Both places represent two different modalities of contact: long-term colony vs. short term visit. In Taiwan a Spanish colony (site name HPD-B) was founded in 1624 and taken by the Dutch in 1642 until 1662. No other colonial site in the region reunites yet the same conditions for this study. In Alofi, European first contact with J. Le Maire and W. Schouten occurred for 13 days in 1616, and apparently as a consequence, this 8 km-long island was abandoned and only used for agricultural purposes afterwards. This makes it a unique case for the study of demographic impacts in the Western Pacific.

The goal of this RS is to define archaeological markers of processes of direct contact, meaning **changes in material culture**, in the **subsistence** (and its markers: botanical and faunal remains), **new ways of life** on the part of colonizers (in Taiwan), and **environmental changes** (erosion and changes in the landscape), already recorded in Taiwan. An emphasis is also placed on changes most likely due to the introduction of foreign species: since sweet potato is difficult to detect in the fossil pollen record, we will 1) analyze lithics and pottery, useful for the detection of starches, as well as human remains, and in particular teeth on which starch and phytoliths can be trapped and preserved by the building-up of dental calculus, 2) analyze botanical sequences searching for changes in the 16-17th centuries, through: i) sediment and botanical microremain indicators, namely pollen grains and phytoliths, for increasing and/or change in landscape clearance and degradation as indirect markers for the presence of sweet potato (as carried out in PNG, see Haberle and Atkin 2005); ii) other commensal species introduced around this time, prone to detection –the introduction of sweet potato did probably not happen alone: for example papaya and pineapple were also transported by Iberians from America to the rest of the world (Ferrão 2005); 3) assess the possibility that sweet potato is associated with the expansion of dryland agriculture, an interesting consequence of its introduction in Hawai'i, which entails an increase in production and population (Ladefoged et al. 2005: 369). As for pathogens, we will study changes in land use and burial practices, as well as human remains, around the 16th-17th centuries. Human remains from the time period exist in both case studies in Alofi and Taiwan, and anthropological examination can determine the presence of infectious diseases. Also examination of the genetic remains of bacteria and viruses on archaeological human bones/teeth is a promising field for detecting potential diseases and epidemics. Likewise, genetic studies of human archaeological remains can provide information about their history including infectious diseases survived by ancestors, which strongly express in the descendants the genes that allowed survival. In the Pacific this approach has not been implemented yet.

The project will carry out survey, excavation and analysis of the material. In Taiwan, where the Spanish colony is well located and on-going archaeological research is in progress, the strategy centres on excavation. In Alofi, the project will first do survey, intended to trace the character of the land use in pre- and post-early contact moments. The survey design will be supported by remote sensing analysis and spatial analysis, and it will comprise the whole 8 km-long island. Remote survey techniques are particularly important in areas as heavily full of vegetation as Pacific islands, as they contribute to the "maximizing" of the survey using non-invasive methods. This methodology, including the use of satellite imagery, has been successfully implemented by the applicant on small-sized islands before (Cruz Berrocal et al. 2015). The survey will be followed by a more detailed exploration on the ground, through a sampling of test pits,

trenches, and corings, to obtain an accurate botanical and archaeological sequence. Excavation will be carefully planned in specific sites for recovery of soil, pottery, lithics, faunal and plant microremains, and human remains. Revision of previous collections is also part of fieldwork activities.
In Taiwan, fieldwork will be carried out during the first 4 years of the project. In Alofi, fieldwork will be developed during the 3 central years of the project.

Analytical programme: NAO includes the help of expert collaborators in specific and innovative methods:

1. Remote sensing: high-resolution imagery (Landsat-Modis, RADAR, DEM, LiDAR, if available) for spatial analysis.
2. Geomorphological analysis for reconstruction of landscape processes in combination with archaeobotanical research.
3. Accurate AMS radiocarbon and fresh coral dating for the reconstruction of sequences.
4. Anthropological examination of human remains for the identification of disease.
5. Human DNA analysis for ethnicity and history of populations, including survival to infectious diseases in the past.
6. DNA analysis of viruses and bacteria on human bones, for identification of disease.
7. Analysis of pollen, phytoliths, and starches to track changes in vegetation and diet in the 16^{th}-17^{th} centuries.
8. Plant DNA analysis for identification of sweet potato and other species transferred in the 16^{th}-17^{th} centuries.

Feasibility: Ample archaeological data directly relevant to the topic has already been produced by the applicant and collaborator Christophe Sand (Cruz Berrocal 2015; Sand 2003), which ensures the production of results early on. Preliminary agreements for permits with the respective authorities have been made. Processing of archaeological materials is developed in the field, as it is cheaper than to transport materials to host institution. The field team is led by the PI in Taiwan, supported by the collaboration with Christophe Sand and his team in Alofi. Other personnel is also involved in the field and in lab work when not in the field.

RS 3) Characterization of impacts of indirect contact, through Network Analysis models

Network Analysis (NA) is a very promising area for tackling archaeological problems (Brandes et al. 2013, Brughmans 2013). This project proposes that the construction of NA models, or mathematical systems that use known archaeological, historical, ethnographic and bioecological data, will bring light to the problem of indirect contact in the Pacific by running plausible simulations that reconstruct histories of the spread of European proxies among the islands, without European intervention. The models will recreate different scenarios to estimate how and at which rate the spread could have occurred. For sweet potato, in fact an index of the introduction of foreign plant species, the models will answer these questions: how do the patterns of connectedness in the region explain its spread? Can we assume that the introduction of a foreign species does not affect an island ecosystem? How many other species, still invisible for us, could have been introduced or removed without affecting the resilience of the system? A predictive ecological model can be unfolded from our analysis of botanical sequences in the field from this premise, to search for impacts in the 16^{th}-17^{th} centuries. Finally, how likely is it that given all existing lines of evidence and known facts, sweet potato did not spread over the Western Pacific during the 16^{th}-17^{th} centuries? This is a formal null hypothesis that we will accept or reject based on our NA models. For pathogens, we will answer these questions: how did the spread of diseases take place, and how likely is it that diseases introduced into particular areas did not affect other areas of the Western Pacific? How likely is it that the same diseases that in the 18^{th} century caused catastrophic mortality even through short-contact events, did not produce the same results in the 16^{th}-17^{th} centuries? This is a formal null hypothesis that we will accept or reject with the help of our models.

Feasibility: Since this is a relatively under-researched area, the precedent set by my collaborators Ulrik Brandes, PI in the ERC Synergy project Nexus1492, and Jordi Bascompte's study of ecological networks through an ERC Advanced Grant, will greatly benefit NAO. Diseases would have travelled just as the sweet potato, so basic models of connectedness are the same in both cases. The specific variables about the physiology of the species are inputted by project members and collaborators.

RS 4) Elaboration of an Information System

NAO will integrate in a relational Information System data generated by the above-described Research Strategies, itemized as i) archives, ii) archaeological literature, iii) existing and newly created archaeological datasets for Alofi and Taiwan, iv) existing and newly produced oral history, v) ecological and biological input obtained for the creation of models. By putting together varied fragmentary sources, NAO will for the first time record and visualize all the fundamental facts and processes pertaining to the early European presence in the Pacific around the 16^{th}-17^{th} centuries, allowing us to detect networks and missing links, to identify gaps in the data relevant to our specific questions, and to imagine new ways in which we can fill those gaps. A preliminary data model and prototypical Information System with limited data has already been implemented, based on i) a combination of databases, Geographical Information System, qualitative

data analysis, and code writing at every stage to make datasets compatible and provide analytical capacity; ii) interoperability through the use of Dublin Core and ISO standards; iii) use of metadata for every piece of data (geographical and temporal); iv) multiscalarity; v) visualization, so far little used in historical and archaeological projects, but fundamental for understanding large sets of data and navigating complex information. Visualization tools will help in the a) exploration of data, b) verification of our null hypotheses, c) creation of models; vi) digital publication and universal access to data and research. The NAO Information System will create an innovative tool to consult, analyze, and visualize data as an open access resource.

Feasibility: My previous experience (see CV) and the precedent set by my collaborator Tobias Schreck, PI in the EU FP7 PRESIOUS project, among other collaborators and PhD tbd, ensure the development of an effective and innovative tool, with further applications in archaeological and historical research.

Scientific contributions and innovative aspects

NAO challenges traditional views by considering Pacific islanders as actors of their own history on, at least, equal terms to Europeans. Up to now, European narratives are ultimately driven by the same paradigm, only dissenting in which nation came to be the 'discoverer' (e.g. in the case of Australia). NAO attempts to confront European historical narratives by telling the stories of the peoples who weaved the tissue of life in the Pacific long before Europeans played a role in it. The potential consequences of direct and indirect contact in the 16^{th}-17^{th} centuries can have had a major role: it is obvious that demographics are one key to understanding history; also, gaining insight about how local peoples behaved intentionally towards foreign elements introduced in the first encounter with Europeans will contribute to a better understanding of how this episode may have shaped later encounters, a possibility that has not yet started to be recognized. Also, by focusing on the introduction of foreign species, NAO will start to systematically address the history of the 'ecology of the first encounters', making use of innovative analytical and Network approaches. By bringing together written sources, archaeological fieldwork, innovative analysis, and empirical and theoretical models, we will open an unprecedented avenue to study a pervasive but difficult topic such as direct and indirect contact at the beginning of the Modern Period, critical in the Pacific and in many other historical situations in different regions. In short, the project will create *basic knowledge*, enlarging our knowledge of the European cultural heritage outside its boundaries and working towards a deeper understanding of the impacts of newly introduced species into local environments with a long-term perspective, which can affect our current approaches to this problem.

Moreover, the combination of different disciplines and relatively disparate datasets into one coherent body of knowledge will be a very important contribution of this project. The articulation of different research programmes is a challenge in every scientific domain and entails risks, hence the emphasis on the implementation of an Information System that can deal with this challenge. The NAO Information System will be one major achievement in terms of *applied knowledge* of the project and inspire new solutions for the handling of data in historical and archaeological research, in line with K. Kristiansen's (2014) proposition of a New Paradigm for archaeology, observed too in NAO's integration of scientific analysis and interpretation.

Finally, my connections with local institutions in Taiwan and Western Polynesia will no doubt consolidate through this 5-year research, to create long-term interdisciplinary collaboration. Fieldwork necessarily entails very close cooperation with the local people, as our logistics depend completely on them, and furthermore, indigenous communities also gain knowledge about their past along with us, and being the focus of foreign research may contribute to create self-awareness and esteem.

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