ERC Consolidator Grant 2016
Research proposal [Part B1]

Networks Across Oceania

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

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

The Pacific is considered by traditional historiography an isolated and marginal region until late in the 18th century, a notion that has contributed to an incomplete understanding of global history. This project challenges this view seeking to expose the scope of the earliest European presence there during the 16th-17th centuries and its consequences for native societies of the Western Pacific, caused by direct contact as well as indirect impacts driven by the introduction of new species into the island environments.

The project will, through a multidisciplinary effort 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 species introduced by Europeans: pathogens and sweet potato; 3) study indirect contacts using Network Analysis for constructing models of the spread of these species that will act, among other things, as predictive devices for further fieldwork; 4) integrate data in an Information System to create innovative visual analytical capacity and a tool for publication.

NAO gives a twist to the historical treatment of the earliest European presence in the Pacific by re-conceptualizing events into historical processes of cultural transformation through the action of the local peoples, focusing on social and ecological long-term changes. NAO's combined work will create a breakthrough in our understanding of the history, anthropology and archaeology of the region, and will benefit other fields such as historical ecology, Network Analysis and Computer Science. NAO is innovative in its research question, never seriously addressed; in the completely new implementation in the Pacific of complementary lines of research to tackle this problem, including cutting-edge analytical tools; and in its conception of the Pacific not as a blank space but as a network of interconnected places.

[1] 'Nao' is a Spanish generic name for ships, and a specific Iberian ship used for exploration during the 16th and 17th centuries, the vector of the early contact between Europe and the Pacific. https://naoproject.org/

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

State-of-the-art

The major goal of this project is to expose the consequences for local peoples in the Western Pacific of their direct and indirect contacts with Europeans in the 16th and 17th centuries. By showing that these early contacts -direct relations and also indirect effects mainly caused by the introduction of new species into the local environments- did shape the history of the region, NAO will also show that the Pacific was a player in global history in parallel with other world regions. This challenges traditional historiography, which considers the 18th century as the time of the first relevant European presence in the Pacific and has overlooked the existence and extent of earlier entanglements between indigenous populations and Europeans in the 16th and 17th centuries. This multidisciplinary project investigates their direct and indirect interactions through a combination of written sources, archaeology, bioecological research, and Network Analysis.

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 to be incorporated into the Western colonial worldview. 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, 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 James Cook, the source for these common extrapolations to understand historical processes in other areas, neglects the scope and impact of earlier European entanglements 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 (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), 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, never undertaken yet, of these European endeavours and responses to them from native peoples 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.**

Very briefly, the reasons for the lack of scholarly attention to this problem (beyond some popular works such as Langdon 1975) lie in my view in a concept of 'Eurocentrism' that excludes Iberians, of which a symptom is the assumed opposition between archaic Iberian mentalities and Anglofrench Enlightened ideas; in a sheer lack of knowledge of the voyages partly caused by the secrecy employed by the Spanish in their endeavours; and in *a posteriori* prejudices against the relevance of the Pacific in political and global terms in the 16th century, among others (see Cruz Berrocal 2016 for a more exhaustive explanation).

Objectives

The project will reshape the history of the European-Pacific interaction in its early stages, thus changing our understanding of the history of the region broadly speaking and having a strong influence on our telling of

the beginnings of global historical processes, 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 appropriate case studies, Taiwan and Alofi (Wallis and Futuna), where we have assessed the suitability of archaeological approaches to study short- and long-term direct contact as seen, among other markers (see below), in vegetation changes in the 16th-17th centuries; changes in land use; and burials and human remains. Special attention will be paid to species introduced by Europeans: 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 spread of those species, 4) combining data sources in an Information System with analytical visualization 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 of the European activities at this stage to adequately investigate NAO's research question: **what were the consequences of the European endeavours in the Pacific in the 16th and 17th centuries?**

NAO is the first step in the direction of applying a *human-driven ecologically-based 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: in this case, sweet potato and pathogens. *Sweet potato* is a very significant element in Pacific archaeology due to extant 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 (e.g. Allen 2005). Different lines of evidence converge to point to the European introduction in the 16th-17th centuries. *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, the same kind of interaction, or even longer and more intense, during the 16th-17th centuries, has not received consideration yet.

Although these species were not directly introduced in all Western Pacific islands 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 and materialized by the local social dynamics.

Research Strategies (RS) and methodology

The project will create synergy with the combination of 4 Research Strategies:

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 local peoples and the early contact in the Pacific. They hold, however, a wealth of data that must be exploited from a multidisciplinary perspective to show the scope and potentially significant effects of European presence there 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 the Netherlands, dating to between 1519 (initial voyage by Magallanes) and 1662 (end of the European colonies in Taiwan). They include chronicles and diaries; log books; maps; and edited sources. The goals, never addressed before, include: organization of a cartographic repertoire of each expedition; revision of the ship routes; and 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 of 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 · navigation routes, potential places where visual or real contact may have been established, colonies founded; · plant and animal species in cargos, methods of transportation; · health of the crew; · estimates of native populations; · reactions of natives to contact, oral history; · objects of exchange, theft, smuggling; · environmental aspects; · climatology and natural disasters; · navigation techniques; · social organization of natives, gender roles, changes during the contact period; · existence of linguae francae, social roles of language.

Feasibility: the archives are already known to the PI and cooperation partners and the volume of material has been evaluated (including the extensive VOC -United East Indian Company- sources, well studied by cooperation partner Gerrit Johannes Knaap) and selected to render an accessible number of relevant documents for examination for a core of 5 researchers during the first 2'5 years. Partial work is 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 been selected due to their representativeness: a) they stand for both large and small islands within the Austronesian universe; b) Taiwan is the main scenario of the well-known 'in/out-of-Taiwan' debate for the expansion of the Austronesians, and Alofi lies at the boundary between Melanesia and Polynesia thus receiving influences from both; c) neither was isolated prior to European contact, yet their exposure to foreign agents was divergent: Taiwan had been in contact with the continent for most of its history, yet remained Austronesian despite Chinese presence -and did not become a Chinese peripheral area until Europeans left, an outcome outside the scope of this project- while Alofi was never exposed to continental contact; d) they represent two different modalities of contact with Europeans: long-term colonial contact vs. short term visits. In Taiwan the Spanish colony of San Salvador de Kelang (in Keelung, site name HPD-B) was founded in 1624 and taken by the Dutch in 1642 until 1662. By contrast, Alofi received a visit by J. Le Maire and W. Schouten 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; e) both Taiwan and Alofi have been scenarios of our previous research and we have attested that contact and its material consequences can be studied through archaeology.

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 **human-induced environmental changes** (e.g. erosion associated with European presence or local abandonment). 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*, where starches of sweet potato and other plants can be embedded in micro-porosities and fissures, and be preserved over centuries, as well as *human remains*, and in particular teeth, where starches and phytoliths can be trapped 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 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 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, and genetic studies of human archaeological remains can provide information about their history including infectious diseases survived by ancestors. Neither approach has been implemented in the Pacific yet.

The project will carry out survey, excavation and analysis of the material. In Taiwan, where the Spanish colony is 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 (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 correspondence with the partial goals enumerated above, the following ***analytical programme*** will be implemented:

· Remote sensing: high-resolution imagery (Landsat-Modis, RADAR, DEM 25x25m; LiDAR when available) for spatial analysis and survey preparation (some can be obtained free from different agencies).
· Geomorphological analysis for reconstruction of landscape history in combination with archaeobotanical research.
· Natural soil coring and microfossil content analyses for identification of vegetation changes; starch, pollen and phytolith analysis in tooth calculus and on material culture used to process foodstuffs.
· AMS radiocarbon and fresh coral dating for the reconstruction of sequences.
· Anthropological examination of human remains for the identification of disease.
· Isotopic analysis for determination of population history.
· Human DNA analysis for ethnicity and history of populations, including survival to infectious diseases when possible.
· Pathogens DNA analysis, for identification of disease.
· DNA analysis of botanical remains, e.g. to distinguish Polynesian/European-introduced sweet potato.

Feasibility: Ample archaeological data directly relevant to the topic has already been produced by the applicant in Taiwan and cooperation partner Christophe Sand in Alofi (Cruz Berrocal 2015; Sand 2003), which ensures the achievement of results early on. Agreements for permits with the respective authorities are in place or in preliminary stages. Processing of archaeological materials will be developed in the field to save costs. The field team comprises a core of 6 researchers directly involved in the project plus additional participants funded by it, as well as researchers engaged in the analytical programme, who include internationally recognized experts in their respective fields. Fieldwork will be carried out during the first 4 years of the project in Taiwan, and during the 3 central years in Alofi.

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 create different scenarios to estimate how and at which rate the spread could have occurred. Since this is a whole new concept, these very important research questions will come up and be answered by our models: For sweet potato, in fact an index of the introduction of foreign plant species, 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? **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 16th-17th 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 18th century caused catastrophic mortality even through short-contact events, did not produce the same results in the 16th-17th centuries**? This is a formal null hypothesis that we will accept or reject with the help of our models.

The models will also help to expand our field strategy and bridge theory and practice by guiding the selection of two islands for **additional sampling** of vegetation and human remains, which will both test the models and improve the representativeness of our archaeological case studies.

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. The additional sampling will be aided by readily available archaeological records.

RS 4) Elaboration of an Information System

NAO will integrate in a relational Information System data generated by the above-described Research Strategies. 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 16th-17th 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. The Information System will be 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 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. The development of the Information System occurs in parallel with the generation of data in the other RS.

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. European narratives are ultimately driven by the same paradigm, only dissenting in which nation came to be the 'discoverer' (e.g. the case of Australia). NAO attempts to confront these 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 16th-17th centuries can have had a major role: it is obvious that demographics are key to understanding history; also, the way local peoples behaved towards foreign elements and first interactions with Europeans did no doubt shape later entanglements, a possibility that has not yet started to be recognized. Moreover, understanding two centuries of neglected historical processes in the Pacific appears as a most important task to rightly place it in the **context of the new world born in the Early Modern Period** and of **the colonial past**, but this knowledge is also key for **current social and political struggles of the indigenous** societies.

By bringing together written sources, archaeology, innovative analysis, and empirical/theoretical models, NAO will create *basic knowledge* to correctly readdress this so far neglected history and also open an unprecedented avenue to study a pervasive but difficult topic such as direct and indirect contact, critical in the Pacific and in many other historical situations in different regions. This will benefit other knowledge areas such as historical ecology: NAO will start to systematically tell the '**ecology of the first contact**' putting special emphasis on unknown time-depths involved in the processes of introduction of new species. Other fields such as Network Analysis and Ecological Networks will also benefit from these analyses.

The integration of disciplines and disparate datasets into one coherent body of knowledge (in line with Kristiansen's (2014) archaeological New Paradigm seen also in NAO's combination of scientific analysis and interpretation) will be a very important contribution of this project too, as the articulation of different research programmes is a challenge in every scientific domain and entails risks; hence my emphasis on the implementation of a NAO Information System to deal with this challenge, one major achievement in terms of *applied knowledge* to inspire new solutions for the handling of complex data which will also improve Computing Science's methods to visualize heterogeneous and qualitative information.

Finally, my connections with local institutions in the Pacific will no doubt consolidate through this 5-year research. But fieldwork necessarily entails very close cooperation with the local peoples too, as our logistics depend on them. My fieldwork among Fijian communities has also persuaded me that this is of high interest to them, as they gain knowledge about their past along with us, and being the focus of foreign research may contribute to create self-awareness and esteem.

Budget

The largest part of my budget will be spent on personnel costs (1.078.530 €), followed by travel (363.000 €) and analyses (114.000 €).

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