ERC Consolidator Grant 2016
Research proposal [Part B2)]

Part B2: *The scientific proposal* (max. 15 pages)

Section a. State-of-the-art and objectives

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 -establishment of 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 world, mainly through James 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 historical and anthropological studies on Oceania have flourished for centuries now. 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 entanglements with the indigenous societies of the Pacific Islands, thus working and making assumptions on the basis of an incomplete image. But the extent of these early interactions was certainly large (figure 1).

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) (see below) 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, carrying out 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 especially 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 (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 Pacific history remains hidden for Pacific and European peoples alike. **This project contends that the thorough study, never yet undertaken, of these European endeavours and the response of native peoples to them will change current perspectives on the history of the Western Pacific by showing that the consequences of direct and indirect contact are more profound and widespread than has been accepted so far**. As Spriggs (1997:234) puts it:

> *"Could the depopulation of these areas [in the Solomons], extreme even in comparison with other areas of Island Melanesia, have begun with the impact of the Spanish themselves? Diseases common enough among Europeans not to merit comment in the accounts, may have been devastating when introduced to a population with no exposure and, therefore, no resistance to them. The Spanish did not stay long enough in the islands to observe the effects of any such introductions. They note that in all areas the local people appeared healthy and without any evident medical conditions. Later accounts of the late eighteenth and early nineteenth centuries paint a quite different picture in some areas, and the catastrophic effects of the introduction of diseases by passing ships is well documented for that era. (...) Future archaeological projects directed at (...) the areas visited by the Spaniards should allow us to establish whether in fact the decline in population is a phenomenon begun in the sixteenth and early seventeenth centuries rather than the nineteenth century."*

A number of reasons explain in my opinion the lack of scholarly attention to this research question (beyond some popular works such as Langdon 1975), among which are a concept of 'Eurocentrism' that factually excludes Iberians, of which a symptom is the artificial opposition between archaic Iberian mentalities and Anglofrench Enlightened ideas, the positioning in Angloamerican historiography of early modern times in an indefined transitional state (Starn 2002), a sheer lack of knowledge of the voyages partly caused by the secrecy employed by the Spanish in their endeavours, and *a posteriori* prejudices against the relevance of the Pacific in political and global terms (see Cruz Berrocal 2016 for a more exhaustive explanation).

Objectives

The project will rewrite the history of the European-Pacific entanglement in its early stages thus changing our understanding of the history of the region broadly speaking and influencing our understanding 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 well-suited archaeological case studies: Taiwan and Alofi (Wallis and Futuna), and paying attention to two European commensal species: sweet potato and pathogens; 3) studying indirect contacts using the emerging field of Network Analysis (Brandes et al. 2013) for constructing models of spread of those species; 4) combining data sources in an Information System with visualization analytical capacity. This combination of goals allows us to study the effects of European direct and indirect contact on local populations in the 16th-17th centuries.

Many historical sources refer to the entire Pacific and will be recorded as such: documents cannot be split and they focus on the entire area, since ships were axes connecting both shores of the ocean. This initial broad scope is necessary for not taking the risk of observing the region as a compartmentalized area, which is against the assumptions of this project (see below). For the study of direct and indirect contact the project is bound to the **Western Pacific**, broadly defined as the area west from Tonga, for obvious reasons: this region comprises the **main scenario of the European activities** at this stage and allow us to better study the central research question of this project: what were the consequences of the European endeavours in the Pacific in the 16th-17th centuries? In other words**, is it adequate to continue implicitly assuming that contacts may be ignored until the late 18th century** (e.g. Kirch 2000)? My proposed answer is no (figure 1).

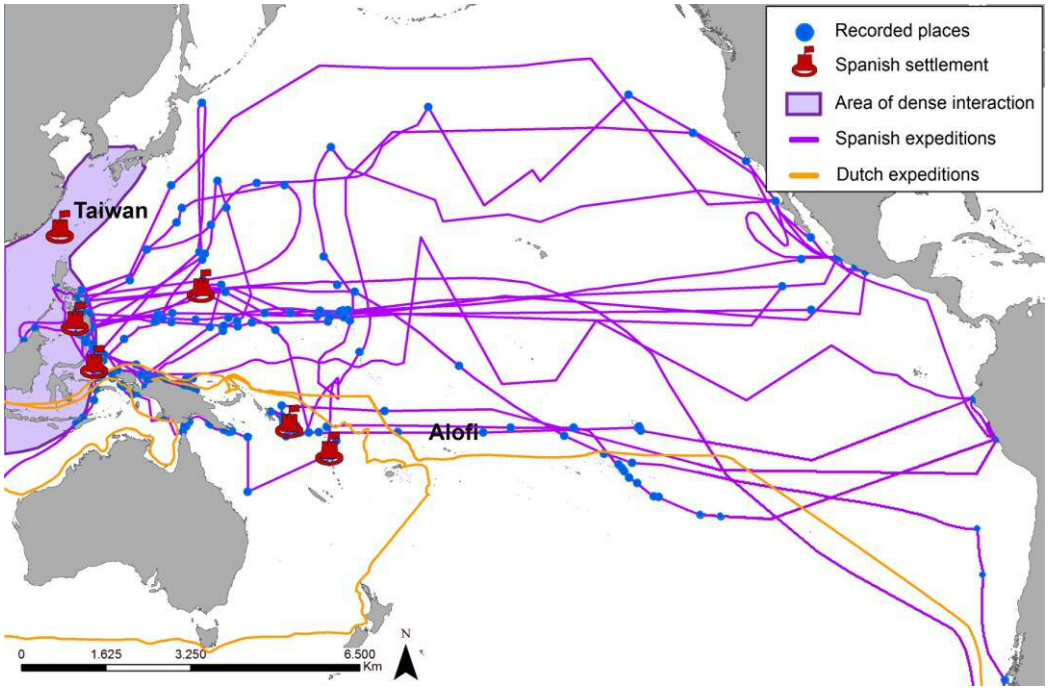

Figure 1.

GIS-based rendering of log-books accounts in Landín et al. (1992).

(1521-1642 AD)

Areas of fieldwork (Taiwan and Alofi) marked with labels.

Research areas

▪ *Research Area 1: historical documents*. A thorough investigation of the historical sources is the first step to address the question of the scope and significance of the European presence in the Pacific in the 16th-17th centuries. Although documents containing a wealth of detailed information about indigenous people and forms of contact abound in archives in the Netherlands, Portugal and Spain, they have never been systematically explored. Two academic traditions have conflated to invisibilize two centuries of history in the Pacific (see also previous section). On the one hand, historians have shown little interest in the 'natives' and therefore documents have not been sufficiently studied to extract information about the local people and

the early contact. On the other hand, archaeologists and anthropologists have shown little interest for the study of this early historical period, and the language barrier may also have contributed to their overlooking the written sources.

The NAO project, for the first time, brings together historians from different backgrounds for a systematic study of the textual evidence provided in the various archives in a multidisciplinary perspective. **This project will create a corpus of documentary data from Spanish, Portuguese and Dutch primary and secondary sources,** first, to fix the scope of their activities, and second, to gather information about native populations. A preliminary exploration of these documents shows a wealth of ethnographic information whose value is greatly increased by being the oldest documentation produced on the topic (figure 2).

These documents must be thoroughly re-read, searched and organized (see methodology, Section b).

Figure 2. "…las islas de los Barbudos (Marshall) y de los Ladrones (Marianas), avistadas entre el 9 y el 23 de enero de 1565 en la expedición de Miguel López de Legazpi a las Islas Filipinas" by pilots Jaimes Martínez Fortún and Diego Martín, AGI, MP-FILIPINAS, 2. (1565 AD)

▪ *Research Area 2: archaeology of direct contact and introduced species.* In order to understand the immediate effects of early European presence on Pacific islands, we will study settings of direct contact with archaeological methods. This is an underexplored area, and very few excavations have been carried out so far. Moreover, these excavations have rendered little evidence in the sites where the Europeans settled in Graciosa Bay (Gibbs 2015) and Vanuatu (Bedford et al. 2009; Flexner and Spriggs 2016). Here, some Spanish material (sherds from one Spanish *botija* or olive jar), probably from Quirós' expedition, has been found further north in the Banks Islands (Bedford et al. 2009:78-84), but nothing on the original colony of Espíritu Santo. The materials in the Banks Islands had probably been incorporated into local trade networks and dispersed from Espíritu Santo, possibly as prestige goods given their exotic origins (Flexner et al. 2015). Thus, an originally weak material presence is further invisibilized by the local social practices.

NAO focusses on two carefully chosen exceptional archaeological case studies: Taiwan and Alofi. By shifting the focus from 'obvious' spots of archaeological research to other less known but productive study cases, **the project will expand the knowledge on how direct contact developed, as well as its consequences.** Taiwan and Alofi are, together, representative of the Pacific and the social dynamics under study in many different ways: a) they represent 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, a fact 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 there through archaeology. I have established contacts and investigated the other two obvious spots of long-term early colonial presence, Philippines and Marianas, but no site appropriate for NAO's goals has been yet located. Taiwan thus proves a much better case study in terms of the available archaeological record and the characteristics of research there, exactly as Alofi does in regard to short contact in small islands. In sum, **the different historical, geographical and cultural situations that both islands represent is sought to fulfill the goals of this project** to allow comparison and to obtain a representative view of how contacts and its impacts unfolded.

Fieldwork will define archaeological markers of processes of direct contact, with an emphasis on vegetation and diet changes in the 16th-17th centuries; and changes in land use and study of human remains from burials as markers of demographic changes. These kinds of changes may be due to the introduction of new species

by the Europeans, whose ecological and biological traces *do have* long-term effects that we can study. Indeed, studies based on the spread of commensal species as proxies to understand human movements in the Pacific have been one of the most interesting developments in the last decade in Pacific archaeology (see Seelenfreund et al. 2010:2 for a summary of commensal species), together with studies on paleoecology (Prebble and Wilmshurst 2009), and human ecodynamics (e.g. works by P. Kirch). These studies aim in all cases to understand prehistoric human colonization of the Pacific islands (also a precedent of this ecologically focused research is N. Boivin's Sealink project to study the diffusion of plant species across the Indian Ocean during prehistory). NAO is the first step in the direction of applying a similar *human-driven ecologically-based archaeological* perspective to the study of the equally important topic of early European impacts in the Pacific in historical times and its repercussions through a particular emphasis on the direct and indirect introduction of two European commensal species into the local environments: we will look for the long-term effects created by the introduction of sweet potato and pathogens. Both elements together comprise a range of *intentional* and *non-intentional* human action, and were key vectors in the European-local interaction. It is important to remark that climate change has not proved to be a factor in this process as far as we can tell: it is social and cultural factors that matter, and the focus of this research.

· **Sweet potato** (*Ipomoea batatas* [L.] Lam.) is an American plant with high relevance for the history of the Pacific as a whole, as on-going debates about when and how it was introduced, demonstrate (e.g. Yen 1974, Ballard et al. 2005, Roullier et al. 2013). The most accepted perspective on this problem is the so-called 'tripartite hypothesis': sweet potato (Kumara lineage) was introduced into Polynesia by Polynesian voyagers returning from South America between 1000 and 1100 AD, probably spreading into Hawai'i, Easter Island, and New Zealand, around 1150–1250 AD (the possibility of a westward dispersal towards Tonga, Samoa, and eastern Melanesia has also been suggested). The Spanish galleons would have introduced the Mesoamerican Camote to the Philippines around 1500 AD (Camote lineage), while Portuguese traders introduced to present-day eastern Indonesia Batata from the Caribbean and Central America (Batata lineage). Two additional European introductions may have contributed to its diffusion, one by Mendaña's voyage to the Marquesas and Solomon Islands in 1595 and another by Quirós in Vanuatu in 1606 (Roullier et al. 2013:2205). The tripartite hypothesis is broadly accepted for Polynesia, but partially rejected for the Western Pacific, in two regards: a) some researchers point to a prehistoric introduction from Polynesia, with PNG as a poignant example: here, sediment and pollen indicators of increasing landscape clearance and degradation have been used as markers for the presence of sweet potato around 1300 AD (Haberle and Atkin 2005), b) some other authors reject both a prehistoric and a Spanish introduction in the 16th century, to propose instead an introduction by Europeans in the early 1800s (e.g. Allen 2005).

This long-lasting controversy is greatly due to the fact that the sweet potato is not detected in the fossil pollen record but through the analysis of carbonized macroremains or its starches (expertise area of ACh[1]). Thus, an early presence of the sweet potato in pre-Spanish times in the Western Pacific would reinforce the hypothesis of a Polynesian introduction from America into the Pacific, and its many implications, but it has not really been attested, and PNG appears as an isolated outlier. Moreover, different lines of evidence point to an introduction by the Portuguese and Spanish in the 16th-17th centuries into Indonesia, the Philippines, and the Western Pacific (and maybe Solomon and Vanuatu): the triple scenario of the tripartite hypothesis has been recently confirmed by DNA analysis (Roullier et al. 2013), which points to a very sharp boundary between Polynesia and Island Melanesia, with a very restricted movement of sweet potato germplasm between East and West, without excluding the possibility that these movements happened in later times. Also, sweet potato was introduced by the Spanish and cultivated in the Marianas because it was amenable to long-term storage and was used to provision galleon ships, and indeed archaeological evidence of the sweet potato in the Marianas before Spanish contact is lacking, but it was identified in ceramic residues at a 17th century site in northern Guam (Bayman et al. 2012:265). Moreover, accounts from the late 18th century gathered by the first European voyagers after Spanish and Dutch travels testify to the presence of sweet potato in New Caledonia (Labillardière in 1793), and interestingly, in Milne Bay, PNG and Santa Cruz, Solomon Islands (D'Entrecasteaux in 1793), targets of the Spanish travels, among others. Finally, the sweet potato expanded from the Philippines (Spanish) and Indonesia (Portuguese) into the adjacent areas very quickly, without European intervention: it was a staple in certain areas in China by 1563, and among other places, in Batanes it was a staple crop recorded by W. Dampier and the Spanish Dominican fathers by 1686 (PI's ongoing research).

Surprisingly, the Spanish documents have been used in the discussion of the introduction of the sweet potato only through secondary or third-hand sources and translations, e.g. Allen (2005): "No attempt is made [here] to examine the primary sources associated with the voyages of European explorers (…) as these have already

[1] Initials identify cooperation partners throughout the text. Please see table 'Cooperation partners and personnel'.

received adequate treatment (Dixon 1932:42-3; Hornell 1946:48; Yen 1974:8)". Allen (2005) is one of the authors who don't accept the Spanish introduction of the sweet potato into Melanesia, although he takes at face value the recordings of Spanish seeing 'sweet potato' in different places, gathered in Dixon (1932) based on Markham (1904), a translation of Zaragoza (1876 and 1878). But neither Zaragoza nor Markham had a special interest in the sweet potato, a problem first brought up by Friederici (1929). After the secondary sources, it is taken for granted that Spanish 'saw' sweet potato in places where it did in fact not exist before them. Among several reasons, it could be that this plant was mistaken by the Spanish themselves, them being also newly exposed to this American plant. And this is only one of the potential problems faced by current biased interpretations of ancient texts based on old translations. (In fact errors in Markham's 1904 translation are not few, and the same is true of Villiers' 1906 translation of Speilbergen (or Spilbergen) and Le Maire's writings of the 17th century; see below. However, both translations are still the textual sources used by archaeologists in the Pacific). Clearly, the primary sources must be studied in search for clues of the original introduction, among other things.

Indeed it is not known how many plant species could have been tentatively introduced. This project uses sweet potato **as a proxy of European influence and a potential index of the introduction of foreign plants**. The **expectation** is that, **since new plants were in fact introduced** (e.g. Alofi and Futuna already used sweet potato when European settled there in the 19th century), **this must be detected in the botanical sequence and dated,** as well as disturbances in the sequence related to the new species. NAO is the first endeavour to weave together different lines of evidence to make a lasting contribution to the question of the Iberian introduction of the sweet potato into the Pacific in the 16th-17th centuries, and its further spread.

· **Pathogens**. Disease transmission (through parasites and through humans) or virgin soil epidemics (meaning "rapid spread of pathogens among people whom they have never infected before" (Crosby 1986)) are factors of change in contact situations and a sensitive topic with huge implications in current political issues, Pacific archaeology and island history (see Kirch and Rallu 2007). There are many examples of drastic population changes in most archipelagos at the time of European contact: e.g. the figures in Guam (Marianas) at the arrival of the Spanish in 1668 estimate around 30.000 Chamorro natives in some 180 settlements; a Spanish census in 1710 mentioned around 3.500 individuals (Hezel 1982). Most of the known examples, for obvious reasons, date to the later contact in the 1800s. Not only epidemics, but also their secondary effects, such as sterility, can result in demographic changes in the long-term.

This project proposes that the introduction of foreign diseases to the region at large must necessarily have taken place with the early European expeditions in the 16th-17th centuries. Different lines of evidence support this position: the most important European diseases to have spread in the Pacific, smallpox, measles, tuberculosis, flu, and venereal diseases, were common cargo in the Iberian and Dutch ships, as the study of historical documents show. Population voids have been documented in the Solomons dated to an unspecified time after the Spanish colonial adventure, but never researched (see quotation, Spriggs 1997, above). The question of the effects of introduced diseases in Vanuatu has never been addressed, but its potential importance has been pointed out (eg. Flexner and Spriggs 2016). My case studies also provide strong evidence in this regard: in Alofi, a place with a total lack of exposure to previous foreign diseases, there was a Dutch visit in 1616, which lasted 13 days. The Dutch wrote that Futuna was populous and Alofi was populated, and statistical estimations have reached the conclusion that there were about 10.000 people in the archipelago at that time. A little more than two centuries later, the first census made by the Marist Missionaries counted about 840 people for Futuna, and no inhabitants on Alofi. The most probable explanation is the introduction of diseases in 1616 (Sand 2003). Even in Taiwan, in touch with the continent in the centuries prior to the European presence, epidemics did take place (e.g. in 1639, smallpox, in Borao et al. 2001:303) and native mortality was very high at any time during the colonial period.

Even places which had no direct contact with Europeans seem to have undergone severe demographic collapses. Indeed, population stagnation or decline start to be recognised (Rallu 2007) not only in Marquesas (that was indeed contacted by Mendaña in 1567), but also in the Cooks, Easter Island, and Gambiers around 1600. Hawai'i sees a stop in population growth immediately followed by decline around 1600 (Rallu 2007:20). These population trends cannot be explained as a convergent evolution of natural population growth and stabilization (as proposed by Rallu 2007) because these archipelagos were colonized at different times. Moreover, the probability distribution of dates obtained in the archaeological record after 1660 in New Zealand and Easter Island also drops sharply: much fewer dates are obtained after 1660, which has been interpreted as a bias of research, unrelated to human behaviour (Mara Mulrooney, SAA 2013, Honolulu, on *Interactive Pacific Island Radiocarbon Database*, Bishop Museum). The coincidence is striking, nonetheless: the pattern of apparent demographic problems during the 17th century appears to be widespread. In places such as New Caledonia demographic collapse involving thousands of people has been dated to the end of the 18th and beginnings of the 19th century simply because historical documents do not support a

longer chronology (Sand et al. 2007a). These roughly 60 years of only sporadic contacts with Europeans seem to be a very short chronology to explain this demographic decay.

This project contends that longer chronologies should be considered in the face of severely catastrophic demographic collapses, especially when only sporadic contacts were involved. Were populations weakened by foreign diseases before the 18th century, leading to such catastrophic figures (see Kirch and Rallu 2007)? Remarkably, researchers attribute catastrophic consequences to sporadic and very short contacts at the end of the 18th and beginnings of the 19th century, whereas the same kind of interaction, even longer and more intense, during the 16th-17th centuries, do not receive the same consideration. The project will address this imbalance by approaching for the first time systematically the problem of the consequences of introduced diseases in the 16th-17th centuries in the Western Pacific. The **expectation** is that, if **a demographic impact even after brief contact is demonstrated** in our case in Alofi, as seen in the evidence, the **effects of widespread direct and indirect contacts in the 16th-17th centuries have to be reconsidered in this light**.

▪ *Research Area 3: Network Analysis.* As figure 1 shows, the areas of activity of the Europeans were large, but most of the interactions did probably not imply direct contact. This represents the main limitation of documents: in spite of their invaluable insights for this research, we do not expect to find e.g. new documents pointing at unknown foundations of colonies. Since researchers have fundamentally relied on this type of information to deduce contact, the generally accepted view remains that early European presence was a minor episode to understand history in the Pacific, centered around a low number of places, mostly with short temporal developments. While I assume that archives will not render yet unknown documents stating new colonization or conquest events, this does not mean that the impact was negligible or that we should not try to understand it. We can indeed predict that there was an impact on most islands even if the colonization events were few, because mounting evidence shows that the Western Pacific was a dynamic interconnected region in which 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, as attested by relatively recent evidence for Polynesian-Melanesian interactions and influential contacts among Vanuatu, Fiji, New Caledonia, Solomon Islands, among others (e.g. Spriggs 1997; Bedford 2006; 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**. But since in this kind of indirect contact situations we cannot simply pinpoint archaeological grounds to carry out traditional archaeological fieldwork on *a priori* unknown parts of the regional network, we necessarily have to develop alternative ways to study this topic, and this project intends to do exactly that: the conceptualization of the study area as a network, and accordingly the use of Network Analysis, provides a unique way forward to develop an understanding of European influences. Thus, the consequences of the European presence in the region cannot be studied as an aggregate of disconnected contact events (expeditions and failed or successful colonization attempts), but through the study of the underlying patterns of connectedness. **I contend that patterned local networks effectively shaped the way early contact events and their consequences made history**. By focusing on the local connectedness that shaped the spread of foreign elements, we move forward from the elusive study of events, difficult to pinpoint archaeologically on particular spots, to the study of the processes underlying this early contact, which conferred sense to otherwise particular events. These events became processes because natives absorbed them into their own local dynamics. Therefore, this project addresses the transformation of events into patterned processes of connectedness through the action of local peoples. The elaboration of models focusses on the aspects that NAO observes as the most significant for understanding long-term changes caused by the early European contact in the Western Pacific, tracking the spread of sweet potato and pathogens, whose relevance has been described above.

▪ *Research Area 4: Information system.* One of the keys of NAO is the exhaustive gathering and **systematic organization of different datasets** produced by its Research Areas. An adequate system of data handling is becoming key in any field as the Digital Humanities grow; it is especially important in NAO due to topic, and geographical, documentary and disciplinary scope, as detailed in Section b.

Section b. Methodology. Synergy of Research Strategies (RS)

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

European archival materials convey all necessary information both on the endeavours (what, where, and when) developed by Europeans, and on the local populations they encountered, but **Spanish, Portuguese and Dutch sources have not been used to extract the ethnographic information** they provide.

We will systematically analyze Spanish, Portuguese (PI, MLT, PhD 2) and Dutch documents (KB, GJK), which together represent the whole spectrum of early European presence in Asia-Pacific. Navigational issues require specific analysis (JVS). The goals are: the organization of a cartographic repertoire of each expedition; revision of the ship routes published until now, which contain problematic identifications of itineraries and places. The study of published and non-published sources to fix the routes and the places touched/sighted by the expeditions (JVS) will allow us to accurately map European activity; systematization of the historiographical information about the expeditions carried out in the Pacific until the mid-17th century; systematization and analysis of ethnographic information conveyed by the documents. Also, special attention will be paid to the proxies of European presence chosen by this project: for sweet potato, NAO will analyze Spanish written documents of voyages and cargos in every expedition and colonization attempt such as Solomons and Vanuatu to review mentions to sweet potato and evaluation of methods of propagation from America. As for pathogens, historical documents will be used to assess the health state of the ship crews, and the consequences grasped by chroniclers, not uncommon, about the spread of disease. Later historical documents will be revised critically to find evidence of disease.

Neither of these objectives has ever been addressed to produce a holistic image of the European presence in the Pacific during the 16th-17th centuries. We will work the documents within the chronological framework between 1519 (initial voyage by F. Magallanes) and 1662 (end of the European colony in Taiwan). The existing types of documents that will be analyzed are chronicles (*memoriales*) and diaries; log books; maps; and edited sources for Taiwan (Borao et al. 2001, 2002; Blussé et al. 1999, Blussé and Everts 2000, 2006, 2010) and Alofi (W. Schouten and J. Le Maire's *De ontdekkingsreis van Jacob le Maire en Willem Cornelisz. Schouten in de jaren 1615-1617* and J. van Spilbergen and J. Le Maire's *Oost ende West-Indische spieghel, waer in beschreven werden de twee laetste navigatien, ghedaen inde jaeren 1614. 1615. 1616. 1617. ende 1618*). The relevant archives for this project are:

· *Spanish:* Archivo General de Indias (Sevilla); Archivo General de Simancas (Simancas, Valladolid); Archivo del Museo Naval (Madrid)/Archivo General de la Marina "Álvaro de Bazán" (Viso del Marqués, Ciudad Real); Biblioteca de la Real Academia de la Historia (Madrid); Biblioteca Nacional de España (Madrid); CSIC (microfilmed contents of the National Archive of the Philippines); Biblioteca de los Agustinos Filipinos de Valladolid and other religious orders such as Dominicans and Jesuits, which accompanied expeditions.

· *Mexican:* Archivo General de la Nación (México, D.F.); Biblioteca Nacional de México (México, D.F.).

· *Portuguese:* Biblioteca de la Sociedad Geográfica (Lisboa); Biblioteca Nacional de Portugal (Lisboa); Archivo de la Torre do Tombo (Lisboa); Arquivo Histórico Ultramarino (Lisboa).

· *Dutch:* TANAP (www.tanap.net); National Archives of the Netherlands (Leiden/Amsterdam/The Haag).

In subsequent projects British, Filipino, Peruvian, and Roman (Propaganda Fide) archives will be visited.

Methodology for the study of documents

The study of documents requires a systematic approach at different reading levels: a) Spanish, Portuguese and Dutch documents will provide direct data of European activities and their scope, as well as all possible ethnographic data about the natives; b) the same documents will provide data on Chinese and other agents: whereas Spanish priests tend to note the presence of Chinese as they arrived at new places –they were considered as obstacles to the evangelization of the natives–, Chinese documents do not mention any territory to the East before the 17th century, and at that time only sparse references to Taiwan are to be found (GRS). However, my own work in Taiwan seems to point to the Chinese as catalysts of later European colonialism in specific spots. Filipinos and other groups who navigated regularly among different islands but did not leave written information by themselves can be also tracked down in Spanish and Portuguese documents; c) a selection of documents from much later expeditions will be searched for estimates of population and references to previous contacts: populations contacted in the 18th century could have experienced previous contact episodes or their consequences, not recorded at the time but only in later episodes. Anthropological literature on "non-contacted" people (many consciously isolating themselves after first contact) can be a useful input in order to detect that possibility.

To systematize information, documents will be coded (through databases) and their contents too (through **qualitative data analysis**). Coding allows us to recover data in the Information System (see RS 4), and to perform a systematic analysis through a set of categories/metadata encoded in the texts as they are 'read'/analyzed (software: Atlas.ti). Both written and graphic documents can be analyzed in this way, which promotes the equal handling of texts, maps and drawings. The categories encoded in the documents, although not completely fixed, are predefined (listed here in synthetic form): · navigation routes, potential places where visual or real contact could have been established, colonies founded, potential areas of activity; · plant and animal species transported in the ships, methods of transportation; · health of the crew, diseases endured by sailors; · estimates of populations in islands; · reactions of natives to contact, oral history,

phenotypic characteristics of natives (abundant references to red-haired peoples and European descendants); · objects of exchange, theft, smuggling; · environmental features; · 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**:* historians have been involved in the design of this strategy from the first steps; the volume of material to be researched has been evaluated (including the extensive VOC -United East Indian Company- sources, thoroughly researched by cooperation partner Gerrit Johannes Knaap) and selected to render an accessible number of documents for examination: most repositories have been already researched by the PI (who spent research time in 2014 and 2015 in archives in Spain) and cooperation partners: they include a Postdoctoral researcher (SCR) with training in paleography, historians MLT, GJK, JVS, GRS, ChF, and PhD students KB and PhD 2, as well as assistance from paleographist LZ. Partial results are in progress and will be included in the Information System at an early stage. The qualitative data analysis has already been implemented by the applicant with documents from Taiwan and Batanes, pertinent to this research.

RS 2) Characterization of direct contact through archaeological fieldwork

Archaeological fieldwork in Taiwan and Alofi, both Austronesian areas and best representative case studies to study the questions asked by this project, will allow **us to characterize the consequences of direct contact between Europeans and local populations in the early stages of the Modern Era**.

The Taiwanese early colonial period has been studied by successive projects led by the PI since 2011. Excavations in HPD-B (Cruz Berrocal 2015) show a complete sequence of occupation from the Neolithic, with seasonal and recurring settlement and a transition into the Iron Age which shows clear continuation in ways of life. This was radically disrupted by the Spanish settlement, which dismantled the previous dwellings to make conditioning works for the colonial needs, associated with big changes in the use of space and environment. A big European building has been uncovered, identified as the colonial convent with associated burials, one of them a baby burial with native ritual, and another one DNA-identified as European (Cruz Berrocal et al. in preparation). This cemetery can then either point to a certain tolerance shown by the Fathers to indigenous rituals, or that different degrees of 'conversion' to Christianity could have co-existed, both of them possibilities that are not assessed by the texts. The introduction of diseases can be tracked on the burials of the conventual cemetery, only partially excavated at this point, but also the introduction of new plant species: the Spanish built a garden next to the convent, as observed in the complete disruption of the natural pattern of clay deposition with a thick layer of organic soil. This work in HPD-B is accompanied by current elaboration of a geodatabase of all archaeological sites in Taiwan, which gives us necessary knowledge of the archaeology of the island and context for our site and allow us to prove the disruption of previous trade networks caused by the colonial spots at the island scale.

Alofi lies at the boundary between Melanesia and Polynesia, which makes it an interesting case study for the investigation of introduced species. Previous research there includes E. Burrows' ethnological work, P. Kirch's short excavations in 1974, and D. Frimigacci's ethno-archaeological project on Alofi and its sister island Futuna between 1984 and 1990 with a general survey, recording of oral traditions with associated genealogies, and a series of excavations (Sand 2003), of which large sets of archaeological data remain to be published in full. A general chronology for the archipelago (Frimigacci 1990; Sand 2003) is as follows: it was settled around 800 BC by Lapita groups who colonized all the fertile regions, leading to a massive process of erosion through slash-and-burn agriculture and the destruction of the native forest. The spread of the population can be followed through the expanding number of ceramic sites, and from the beginning of the second millennium AD the record shows the advent of more hierarchical political systems. Ethnographic political structures in Futuna are in ethnohistorical times surprisingly fluid compared to the rigid chiefdoms known in the neighbouring archipelagos, which can be explained by a demographic collapse produced by Western diseases introduced in 1616 (Sand 2003, 2016) (see above RA 2, Pathogens). Alofi shows a clear pattern of island abandonment also recorded in oral histories: it is largely covered today with dense forests, while a large number of former villages and burial grounds are observed under the canopy. After abandonment, Alofi was used only as a gardening area. The island is thus an ideal location to study in detail the change in land use induced in the 17th century, as well as the hypothesized associated demographic collapse, and potential changes in vegetation.

The **goals of this RS are the definition of archaeological markers of processes of direct contact**, paying attention to **changes in material culture**, **changes in subsistence** (and its markers: botanical and faunal remains), **new ways of life** on the part of colonizers (in Taiwan), and **human-driven environmental changes** (e.g. erosion associated with European presence or local abandonment). An emphasis is placed on

changes most likely due to the introduction of new species by the Europeans, and related to the particular study of the proxies of European presence:

1) **vegetation changes**: since sweet potato is difficult to detect in the fossil pollen record, we will use relevant coring techniques and the analysis of microcharcoal, sediment, pollen and phytolith analyses, in order to analyze botanical sequences searching for changes in the 16-17th centuries: i) search for sediment and pollen indicators of increasing landscape clearance and degradation as indirect markers for the presence of sweet potato (as carried out in PNG, see Haberle and Atkin 2005); ii) search for other species introduced around this time, prone to detection –the introduction of new species such as 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), not to mention potential associated weeds. Archaeological intervention will also allow us to 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). The possibility of detecting the presence of sweet potato through its insect pests is archaeologically not proved yet.

2) **diet changes**: we will analyze lithic *processing tools and cookware*, where starches and phytoliths can be trapped and preserved, embedded in the objects' porosities and fissures through a constant use/pounding process, as well as *human teeth*: tooth calculus traps and preserves starch grains, including sweet potato's, as well as phytoliths, through its constant building process.

3) **changes in land use**, including reshaping of agricultural practices, as well as changes in **burial practices and study of human remains**: we will provide an understanding of demographic impacts through the verification of the changes in land use in the 17th century, the progressive abandonment of Alofi, and the study of burial practices, as well as extant human remains in both Alofi and Taiwan, dating to the period. They will be examined in search for markers of infectious disease: the bone structure may change as a result of chronic or severe infection, including deformations caused by venereal diseases. Human-DNA analysis from archaeological remains will render information about their origins and, provided enough time has passed, about selective pressure on the populations caused by epidemics. The examination of genetic remains of bacteria and viruses on human archaeological bones/teeth is also a growing and innovative field internationally pioneered by cooperation partner Johannes Krause, who reconstructed among others the bacterial genome of *Mycobacterium tuberculosis* (Bos et al. 2014), key for the research proposed here. The special features of this project and its case studies make it likely to identify smallpox too. The potential contributions expected from this area are signalled by the inclusion of PhD 3. Neither of these human and pathogen-DNA approaches has yet been implemented in the Pacific.

A strong ***analytical apparatus*** designed together with cooperations partners MSL, FV, ChS, AG, TB, JK, PhD3, and ACh, will be unfolded to accomplish the goals described above:

· Remote sensing (MSL): 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 (MSL) 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 material culture (ACh).
· AMS radiocarbon and fresh coral dating for the reconstruction of sequences (outsourced).
· Anthropological examination of human remains for the identification of disease (FV).
· Isotopic analysis for determination of population history (outsourced).
· Human DNA analysis for ethnicity and history of populations, including survival to infectious diseases when possible (AG).
· Pathogens DNA analysis (JK, PhD 3, TB), for identification of disease.
· DNA analysis of botanical remains (outsourced), e.g. to distinguish Polynesian/European-introduced sweet potato.

Methodology for archaeological fieldwork

The fieldwork is oriented towards the fulfilment of the above-mentioned objectives; it consists of survey, excavation and analysis of material. In Taiwan we will continue excavations in HPD-B, expanding our activities to the surroundings of the site to understand landscape and botanical changes. In Alofi, the strategy will include first survey, helped by remote sensing mapping and spatial analysis, and it will comprise a statistically significant sample of the island. Remote sensing survey techniques are particularly important in areas as heavily full of vegetation as Pacific islands, as they contribute to the "maximizing" of results using non-invasive methods. This methodology, including the use of high-resolution satellite imagery, has already

been successfully used by the applicant on small islands (Cruz Berrocal et al. 2015). Detailed on-site cartography will also help estimate the size of the sites and population (Sand et al. 2007b, Cruz Berrocal et al. 2015). The survey will be followed by a more detailed exploration of the ground through a series of test pits, trenches, and corings, to define areas for potential excavation.

The required sampling for the analytical programme outlined above will be articulated with archaeological fieldwork: the experts (FV, ACh) will be part of the field team. FV carries out her own excavation of anthropological remains as well as the sampling needed for DNA analysis (both humans and pathogens), isotopes, microfossil content in tooth calculus, and dating. Burials recorded in fieldwork are sampled in statistically significant numbers for excavation and further extraction of samples. Coring and extraction of botanical samples are carried out by ACh with support of the field team. Both FV and ACh will work in Taiwan and Alofi to achieve homogeneity of methods and results.

These methodological options are comprehensive enough to meet the project's goals; when needed, they will be adapted to include the option of searching for associated elements eventually hypothesized by the models (weeds and commensal species, etc., see below). 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.

Feasibility*:* Archival information is available for both cases and ample archaeological data directly relevant to the topic has already been produced by the applicant and cooperation partner Christophe Sand, one of the most relevant archaeologists in the Pacific. This ensures the production of results early on. Permits for fieldwork in Taiwan are currently issued and procedures in Alofi are well-known, so no obstacles are expected. Expenses for each field season cover transportation, per diems of experts in the field, and wages for workers. Processing of archaeological materials is developed in the field to save costs. The field team is led by the PI in Taiwan, supported by collaboration with ChS in Alofi; a Postdoctoral researcher (SCR) will coordinate tasks. Other personnel (ESH, EC) is also involved in the field and in lab work (e.g. database management) when not in the field. The analytical experts will be part of the field team in both cases.

RS 3) Characterization of impacts caused by indirect contact, using Network Analysis models

Network Analysis (NA) is a very promising area to solve archaeological problems (Brandes et al. 2013, Brughmans 2013). This project relies on the elaboration of Network Analysis mathematical models based on archaeological, historical, and bioecological data, to address the problem of studying indirect contact in the Pacific through the reconstruction of plausible histories of the spread of sweet potato and epidemics among the islands, without European intervention. Given the novelty of this concept for the Pacific, very important research questions arise and therefore the goals of the models are:

· *Sweet potato:* to assess how the introduction of sweet potato from particular colonial spots spread into the Western Pacific without European direct intervention. How do the patterns of connectedness in the region account for this spread? It is also commonly assumed that sweet potato was a desirable plant for local peoples for a number of reasons. 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 in our analysis of botanical sequences in the field from this premise, to search for impacts in the 16th-17th centuries. Furthermore, the suggestion that sweet potato was introduced in very late times can also be tested in our models, both in the field and in the empirical/theoretical realm: **how likely is it that given all lines of evidence outlined above, and the connectedness of the region, 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 on the basis of our NA models.

· *Pathogens:* to assess how the spread of diseases could have taken place, and most importantly, how likely it is 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 on the basis of our NA models.

The NA models as proposed by this project materialize a complete new way of thinking about Pacific history, archaeology, and cultural relationships. They will reconstruct general circulation and exchange among different archipelagos in the Western Pacific, based on existing archaeological, anthropological and environmental information and written ethnographic accounts about connectedness, including little explored variables such as possibilities for navigation. This empirical base makes possible and at the same time constrains the models; it is moreover useful to study both sweet potato and pathogens, provided that input about specific variables related to their life conditions are supplied: in the case of the sweet potato, specific variables about its physiology (ACh); in the case of pathogens (TB, JK), variables include: amount of

people; time length of the contact; how many people moved; incubation time; how disease is transmitted (through air, personal contact, animal contact: previous commensal hypothesis for the spread of rats (e.g. Matisoo-Smith and Robins 2008) will also be useful); expected rate of survival of the infected person (there is a paradox involved here, since the less lethal the infection is at the level of the individual, the more widespread the disease will become, and therefore, the more lethal for the population as a whole). Particular attention must be payed to the environment in which the diseases were introduced, since the co-habitation of humans with species such as pig and fowl may have led to different episodes of infection and re-infection – some of the bacteria and viruses under focus can jump the species barrier. This scenario has never been taken into account in the Pacific.

Once the models are implemented, different scenarios can be hypothesized to observe how and at which rate the circulation of the species and general exchange in the region may have occurred: the models act as small historical laboratories that simulate historical processes. But NAO intends to move from theory to field applications using the NA models to guide the selection of two more islands for **additional sampling** of vegetation and human remains, choosing places among those potentially available based on the quality and nature of their archaeological record. This will prove the accuracy of the models and at the same time improve the representativeness of our archaeological case studies.

Beyond predictive uses, additional eventual functions of the models will be the exploration of alternative ecological markers (associated weeds, commensal species) to extend our range of action in the field.

Feasibility: NA models are a relatively underresearched area. The precedent set by Ulrik Brandes with his current project in the Caribbean (Nexus 1492), as well as the internationally recognized research of Jordi Bascompte in ecological networks will greatly benefit NAO (with support from PhD 1) and at the same time expand the implications of the existing precedents. European proxies would have travelled along the same paths than local objects of exchange, so basic models of connectedness are useful for different purposes. Archaeological literature and fieldwork will provide large datasets for the models, and the species-related variables will be inputted by cooperation partners (JB, ACh, TB, JK, PhD 3, FV, AG). The additional sampling guided by models will be carried out when possible on islands where archaeological record is readily available or meet conditions that facilitate our research.

RS 4) Elaboration of an Information System

This project will **integrate in a relational Information System fragmentary and heterogeneous sources of information** generated by Research Strategies 1, 2 and 3: archives and related literature; archaeological literature and datasets; ecological and biological results. Thus, NAO will allow **for the first time to record and visualize all the fundamental facts and processes pertaining to the early European presence in the Pacific around the 16th-17th centuries,** creating synchronic and diachronic pictures out of dispersed data, 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 could fill those gaps. A preliminary data model has been implemented, but the present project is required to produce an adequate work platform to visualize information in real time, make it available for all cooperation partners, and eventually, as an open access resource. The NAO Information System will create a fundamental and innovative tool to consult, analyze, and visualize data on European early presence in the Pacific.

The properties of such Information System are: i) a combination of databases, Geographic 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 or codes for every piece of data. All datasets will combine temporal and geographical metadata: visualization and recovery of data, regardless of their nature, will be performed through a GIS interface. Georreferentiation of information not accurately referenced (e.g. vague documentary references) can be solved in GIS through adscription of points, lines, or polygons. Chronological data, on the other hand, vary from concrete dates, *termini ante quem*, *post quem*, to statistical ranges (C14 dates); iv) multiscalarity, including information and relationships from a particular site, to the island, inter-island scale, and inter-archipelago scale; v) visualization, so far little used for complex archaeological and historical processes informed by heterogeneous data, such as the one studied here, but fundamental for · exploring large sets of data, · verifying our null hypotheses, and · creating Network Analysis models.

Spatio-temporal data are currently visualized using map and network displays. However, how to visually integrate a wealth of additional information (e.g. descriptive texts, bibliographic references, ecological and biological data) in an effective display, is a challenge. Besides network data analysis methods, the NAO Information System will also devise and integrate methods for mapping heterogeneous data in synchronic and diachronic representations, and for computing uncertainties in the data. Visualization needs also to be interactive, allowing not only to visualize the data available at a given point in time but also to accommodate

hypotheses and annotations of experts, leading to updates of the database and the creation of new datasets. Algorithms within the Information System should be able to check the interactively provided input for consistency, possibly deriving new hypotheses about the data. Finally, the system will allow vi) digital publication and universal access to data and interpretation.

Feasibility*:* My previous experience in databases and GIS, and research already developed by cooperation partners (MT, MSL, JRA and Tobias Schreck, PI in EU FP7 project PRESIOUS) have led to this draft conception of the system. We have expertise in all the indicated domains, and in some cases a double area of expertise that complements the needs of the project (e.g. KB has specific training and background in GIS work). Ongoing discussions will involve all cooperation partners (advised by MT, SRH, MSL and ACS) to satisfy all possible data requirements from different disciplines. PhD 1 will work on data requirements for the Information System and the development of visualization tools within a Network Analysis paradigm. The generation of data to feed the NAO Information System has been thoroughly explained above; datasets will also be obtained from **literature**: published information of early European presence in the region is not extremely abundant (see state-of-the-art) and archaeological literature relating to the relevant aspects highlighted by the project is very accessible. Its revision has been ongoing in the last years as part of the applicant's broader work in the Pacific, and will be aided by a Postdoctoral researcher (SCR), EH, ChS, EC, and KB. The NAO project will allow us the systematization of the sources, complementary with research for RS 2 and RS 3.

Risk buffering

The RS outlined above are cooperative while also to some extent relatively independent. The combination of numerous and varied lines of research and evidence (i.e. written sources, archaeological and analytical work, models) allow a strong buffering of risks because i) it creates feed-back among the RS; ii) it contributes a variety of complementary sources and methodologies; iii) it draws from different empirical bases to generate data (e.g. a multiple strategy to finding both sweet potato and pathogens has been implemented, ensuring that an eventual lack of macroremains of sweet potato is made up for with a complete botanical sequence where larger changes can be detected. Likewise archaeological fieldwork oriented to the recovery of human remains complements the study of land use, both of them having the same goals); iv) it makes use of innovative methodologies such as Network Analysis to fill gaps in empirical data.

Scientific contributions and innovation

NAO is innovative in its research question, never seriously addressed and speculatively dismissed; in the implementation of many different lines of research and combination of strategies, never applied in such a scope in the Pacific before; in the approaches used within some of the strategies (e.g. archives); in the analytical tools used, at the cutting-edge of research; and in its conception of the Pacific not as a blank space but as a network of interconnected places. NAO observes Pacific islanders as actors of their own history on, at least, equal terms to Europeans, which challenges European narratives built around events –who arrived first when and where–, leaving explanations of history to a matter of temporal precedence of great deeds of one European nationality over the others. This project attempts to confront the European paradigmatic construction of historical narratives on the Pacific entanglement by telling the stories of the peoples who weaved the tissue of life in the Pacific long before Europeans played a role in it. So far, these stories along with the potential consequences of direct and indirect contact in the 16th-17th centuries have been regarded as anecdotal, but I contend that these interactions may have played a major role in Oceanic history. The *basic knowledge* created by NAO by bringing together written sources, archaeological fieldwork, innovative analytical lab work, and mathematical models will expose two centuries of neglected historical interactions in the Pacific, a first step to rightly place this region in the context of the new world born in the Early Modern Period and the global colonial past. Most importantly, this research is also key for pressing current social and political worries of indigenous societies (see Kirch and Rallu 2007) largely caused by an incomplete perspective on how European interaction impacted their own history. Not even the possibility that the behaviour of local peoples towards foreign elements and first European contact did shape communication, behaviour and exchanges in the 18th century, has started to be recognized yet. The project will lead to a re-assessment of the history, archaeology and anthropology of the Pacific that will also influence the construction of the past of other regions, often based on Oceanic biased models that have not taken into account this early history. NAO will then have an impact on global conceptualizations of the past and also open new windows into the early history of globalization and the role of Oceania to correctly place it in the world context.

Not only the historical treatment of the Pacific will completely change, but also other fields of knowledge will benefit from this research, such as Historical ecology, Ecological Networks, and Network Analysis. By

focusing on the introduction of foreign species, NAO will start to systematically tell the 'ecology of the first contact' in the Pacific opening an unprecedented avenue to study a pervasive but difficult topic, relevant in the Pacific and in many other historical situations in different regions at the beginning of the Modern Period and the European expansion. This research will reinforce our understanding of the impacts of newly introduced species into local environments allowing for a longer-term perspective than it is usually recognized, making a contribution to this problem at a global-wide scale.

The articulation of different research programmes is a challenge in every scientific domain and entails risks; hence the emphasis made on the implementation of an Information System to deal with this challenge. This *applied knowledge* will inspire new solutions for Computing Science as well as for the handling of data in historical and archaeological research, in line with K. Kristiansen (2014)'s New Paradigm in archaeology, observed also in the integration of scientific analysis and interpretation carried out by this project.

This project will also have an impact in another respect: my connections with local institutions in the Pacific will no doubt consolidate through this 5-year research, to create long-term international collaboration. But fieldwork requires very close cooperation with the local people too, as our logistics depend completely on them. We have experience in documenting their oral histories about particular archaeological remains, and attending lectures in local schools, to create awareness among the youngest generations for the protection of their heritage. My fieldwork among Fijian communities has 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.

Expected Scientific results (none of which exist to date):

RS 1: 1) publication of an annotated bibliography of the historiographical production of early European expeditions into the Pacific in the three key languages: Portuguese, Dutch, and Spanish; 2) publication of a Historical Atlas of the early European voyages in Asia-Pacific (compilation of maps); 3) critical revision and update of information in European sources about sweet potato and population health; 4) translations of key works currently known through old and problematic renderings (Markham 1904, Villiers 1906).

RS 2: 1) production and publication of data on the first comparative archaeological history of colonialism in the Pacific; 2) generation of new data about plant circulation and use and early European presence and impact in the Pacific, as well as food and agriculture changes, and dissemination in conferences specialized in the Pacific, in prehistoric and historical archaeology, paleoecology and archaeobotany.

RS 3: 1) development of network approaches in Pacific archaeology through the implementation of models; 2) publications in specialized journals to transfer methods for other potential case studies.

RS 4: 1) creation of an Information System for research and publications purposes, including innovative visualization tools to navigate complex historical phenomena; 2) exhaustive publication of the ethnographic references for the Pacific; 3) generation of thematic cartography, based on high-resolution imagery and thematic maps; 4) granting of free access to databases generated during field and lab work, through the Information System.

Cooperation partners and personnel

Inf. Syst	*Jesús Ropero Amor	JRA	IT expert, in charge of computing applications and design of the IS.
	*Dr. María Sebastián López	MSL	Universidad de Zaragoza. MA in Geographical Information System. Associated with the Laboratory of Geomorphology.
	*Enrique Capdevila	EC	MA in Geographical Information Systems.
	Prof. Dr. Tobias Schreck	TS	Universität Konstanz/Graz University of Technology. Visualization and representation of scientific data. PI of PRESIOUS (http://www.presious.eu/) and CONSENSUS (http://www.consensus-project.eu/).
	*PhD 1	PhD 1	Research on Network Analysis and Information System.
Advisory board	Dr. Monika Therrien	MT	Fundación Erigaie, Colombia. Historical archaeologist with long experience on data integration.
	Prof. Dr. Stefan Hauser	SRH	Universität Konstanz. Historical archaeologist with long experience in integration of written and material sources.
	Dr. Ana Crespo Solana	ACS	CSIC, Madrid. Historian, GIS maritime history. PI of ForSEADiscovery (http://forseadiscovery.eu/)
	Dr. Fang Chen Chen	FCh	National Taipei University of Education. History of the Spanish period in Taiwan.
	Guillermo Ruiz Stovel	GRS	University of California, LA. Chinese sources and Chinese diaspora to the East.
	Dr. Thomas Böttcher	TB	Universität Konstanz. Microbiologist, expert on bacteria and infectious diseases.
Archives	Dr. Miguel Luque Talaván	MLT	Universidad Complutense. Spanish history of the Philippines and the Pacific, and its archival sources.
	Prof. Dr. Gerrit Johannes Knaap	GJK	Huygens ING (KNAW)/University Utrecht. Historian, expert on Dutch history in Southeast Asia.
	Jorge Villar Serrano	JVS	Vicedirector, Museo Naval Cartagena. Professor of navigation (Spanish Navy), expert on naval history.
	*PhD Karsten Bracker	KB	Archaeologist and expert in VOC and Dutch navigation and documents.
	*Dr. Leonor Zozaya	LZ	Universidade de Coimbra. Paleographist, expert in Spanish and Portuguese archival research.
	* PhD 2	PhD 2	Research in Spanish and Portuguese archives.

NA	Prof. Dr. Ulrik Brandes	UB	Universität Konstanz. Computer scientist, pioneer in the field of Network Analysis. PI of Nexus1492 (http://www.nexus1492.eu/).
	Prof. Dr. Jordi Bascompte	JB	Universität Zurich. National Science Prize, Spain, 2011. Ecologist, expert in ecological networks.
Archaeology	Dr. Christophe Sand	ChS	Director. Institute of Archaeology of New Caledonia and the Pacific. Melanesian and Polynesian archaeological expert.
	Dr. Chenghwa Tsang	ChT	Academia Sinica. Taiwanese archaeology, collaborator with the PI.
	PD *Dr. Susana Consuegra Rodríguez	SCR	Archaeologist, collaborator with the PI's previous projects in Taiwan and Fiji. Trained in paleography.
	* Elena Serrano Herrera	ESH	Archaeologist, collaborator with the PI's projects in Taiwan since 2011.
Analyses	Prof. Dr. Johannes Krause	JK	Director. Max Planck Institute for the Science of Human History. He established the research field of Ancient Pathogen Genomics.
	*PhD 3	PhD 3	Analysis of ancient pathogen DNA.
	Dr. Alex Chevalier	ACh	Royal Belgian Institute of Natural Sciences. Americanist archaeobotanist, expert in starches and phytoliths.
	Dr. Antonio González	AG	Universidad Complutense. Geneticist, with a long experience in the Pacific.
	Dr. Frédérique Valentin	FV	CNRS. Physical anthropologist. Expert on human remains in the Pacific.

***** marks the personnel hired by NAO: 10 individuals (PhD=Doctoral student; PD=Postdoc researcher). The remaining cooperation partners have their own positions in academia and they **commit to the project** in alternative ways: a) NAO will **fund analysis, travel and fieldwork** carried out by them, b) they have **specific interest** in the topics developed by NAO and aim at **further extension of their research** through it, c) **co-direction of PhDs**: Karsten Bracker's PhD (PI and Gerrit Johannes Knaap), PhD 1 (PI, Tobias Schreck and Ulrik Brandes), PhD 2 (PI and Miguel Luque Talaván), and PhD 3 (PI and Johannes Krause). Cooperation partners have been engaged in NAO since its inception, rather than being brought in as 'specialists' later on. This is necessary given the **range of strategies deployed**. All members took part in the first NAO Workshop organized by the PI in Konstanz on October 23rd 2015, funded by the University of Konstanz, and presented their own work in relation to the research that will be carried out by the NAO project.

Schedule and list of tasks

I will coordinate Research Strategies and develop tasks as specified in *Feasibility* sections. The coherent synthesis of results will constitute my Habilitation at the University of Konstanz.

		2017		2018				2019				2020				2021				2022		
	Year quarter	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
	Project meetings: decision making, progress assessment	x				x				x				x				x				
RS 1	Definition of routes and contact areas (JVS, KB, PhD2)	x	x	x																		
RS 1	Archival research (JVS, MLT, KB, GJK, PI, GRS, LZ)	x	x	x	x	x	x	x	x													
RS 1	Study and qualitative analysis (MLT, PI, JVS, KB, GJK, PhD2)	x	x	x	x	x	x	x	x	x	x	x	x									
RS 1	Systematization of information (MLT, PI, JVS, KB, PhD2)									x	x	x	x	x	x	x	x	x	x	x	x	x
RS2:Taiwa	Excavation, analysis of artefacts (PI, ChT, SCR, ACh, ESH)			x			x				x				x							
RS2:Taiwa	Further elaboration of DB sites (PI, SCR, LYT)	x	x	x	x	x	x	x	x	x	x	x	x									
RS2:Taiwa	Sampling of soil/botanics (PI, Ach, SCR, ESH, LYT)						x				x				x							
RS 2: Alofi	Establishing local network (ChS)			x																		
RS 2: Alofi	Survey (ChS, PI, SCR, ESH)							x														
RS 2: Alofi	Excavation, analysis of artefacts (ChS, PI, SCR, ACh, ESH, FV)											x				x						
RS 2: Alofi	Sampling of soil/botanics (ChS, Ach, SCR, ESH, PI)											x				x						
Analyses	DNA of viruses and bacteria (JK, PhD3, TB)												x				x					
Analyses	Remote Sensing, spatial analyses (MSL, EC, KB)					x				x				x								
Analyses	Archaeobotanical analyses (ACh)								x				x				x					
Analyses	Anthropological and genetic analyses (FV, AG)								x				x				x					
RS 3	Data gathering (PI, SCR, ChS, KB, ESH, Ach, JB, TB, MSL)	x	x	x	x	x	x															
RS 3	Elaboration/test of models (UB, PhD1, JB, TB, ACh, FV, ChS, PI)					x	x	x	x	x	x	x	x	x	x	x	x	x				
RS 3	Additional sampling based on models												x	x								
RS 4	Elaboration of data model (PI, JRA, MSL, UB, JB, TS, PhD1, EC)	x	x																			
RS 4	Development of visualization tools (TS, PhD1, JRA, MSL, EC, PI)			x	x	x	x	x	x	x	x	x	x	x	x	x	x					
RS 4	Code writing, software integration, data feeding (PI, MSL, JRA)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
	Final publication and PI's Habilitation																		x	x	x	

Section c. Project costs

Although related partial work has already been developed by the PI in previous years, the funding provided by this ERC call is key to really enable the realization of this research in its full scope.

Cost Category			**Total in Euro**
Direct Costs	**Personnel**	PI	169.200
		Senior Staff	