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From refugia to oases: Living in arid environments from prehistoric times to the present day

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The history of human occupation in arid landscapes has always been inextricably tied to the history of water and its accessibility through time. From prehistory to now, populations have successively settled in isolated ecosystems that benefit from significant hydrological resources, or refugia zones, later modifying their environments into social and environmental niches, or oases. Niche Construction Theory (Laland et al., 2000), which conceptualizes the capacity of organisms to modify their own environments and, in turn, to influence their own evolutionary trajectories as well as those of other organisms, allows the integrated study of the co-evolution of these spaces and the societies which occupy or shape them.

-From prehistoric refugia…

Our reading of prehistory is marked by the hydro-climatic fluctuations that affected territorial management, exploitation and modification by human groups and other species in these so-called ecological niches.

In arid landscapes like those of North and Northeast Africa, the Arabian Peninsula, Central Asia, and the deserts of Latin America, such niches are marked by perennial or stable water resources, particularly along certain mountain chains or coastal zones. Refugia may have functioned as isolated ecological niches during cold and arid oscillations, and as ideal settlement and gathering areas during humid phases, offering access to water and allowing human groups to exploit animal and plant resources over the long term.

This concept is also used to explain the presence of Paleolithic populations in parts of the world where human occupation seems to have been impossible as a result of hyper-arid conditions, for example

after the Last Glacial Maximum (Gandini et al. 2016 ; Gavashelishvili et Tarkhnishvili 2016 ; Rose et al. 2013). The 'Coastal Oasis Theory' (Faure et al. 2002; Parker and Rose 2008) suggests that currently submerged sources of water in the Persian Gulf also served as refugia during glacial periods. Since the Neolithic, the sedentarisation of human groups and the development of agro-pastoralism also occurred in these refugia, such as is the case for the highland plains of Yemen (Khalidi and Lewis in press), the 'lomas fog oases' in Peru (Beresford-Jones et al. 2015) or for the large lakes of the Sahara or the Afar (Lesur et al. 2014).

During historical periods, the voluntary and progressive management of these spaces heavily impacts their ecology and their socio-economic roles. Anthropisation is exponential from the Neolithic period onward, encouraging the development of long-distance exchange networks. These niches progressively transform into oases.

-…to oases

The word oasis, which derives from ancient Egyptian and is first mentioned by Herodotus around 450 BC, signifies "inhabited space". The meaning has greatly evolved over time, and has almost taken a romantic turn. However, the definition put forth by Lacoste in 1985 is generally accepted today: oases are intensively cultivated spaces in arid environments located in cold or hot climatic zones that are marked by water shortage.

Oasian spaces which are mainly organized around the management of a stable water resource, are therefore first and foremost agricultural spaces marked by the mastery of hydraulic systems. At the same time, the construction of these spaces necessarily implies social organization, not to mention population densities large enough to maintain them. Oases are also strategic nodes with undeniable political significance, especially in terms of territorial and population control, but also in terms of commercial control due to their integration within exchange networks on a macro-regional scale.

In the scientific literature oases are often perceived as static landscapes which researchers had long assumed belonged to environmental contexts that had been stable for millennia, and that the single contributor to change was the introduction of hydraulic technology. Contrary to these assumptions, recent work carried out by multi-disciplinary teams (cf. Charbonnier et al. in press; Garcier and Bravard 2014), highlight the dynamic nature of these spaces that were influenced by social, economic, technological and environmental factors.

The interweaving of these dynamics have made, and continue to make veritable desert niches of these oases. Human societies that modified and constructed these spaces heavily impacted future generations through the environmental, social and material changes that they generated. The consequences of these short term choices, and their social and behavioral transmission through apprenticeship over time, express themselves in long-term cycles of development, transformation, rupture and abandonment.

This conference proposes the development of 3 themes. Addressing them will allow for a better understanding of the dynamics of refugia, oases and niches that have developed in arid environments from the prehistoric period until now, and specifically in tackling the adaptation of past societies to continuous and/or abrupt climatic and hydrological changes over the long term. This conference aims to illustrate human responses to ecological and social issues, especially pertinent today as we witness oases across the world in full transformation and undermined by soil constraints (loss of fertility), availability of water resources, socio-economic issues (migration, employment) and climate change.

THEME 1
Refugia and oases: palaeoenvironmental, archaeological and palaeogenetic definitions

The first theme of the conference aims to better define and develop the following concepts: refugia and their origins, oases as physical entities (identification and reconstruction), and cultural niches (autochthonous cultures, resilience and biological adaptations).

Refugia functioned as veritable socio-environmental niches during glacial periods, heightening the resilience of human groups. Palaeoenvironmental studies and reconstructions have demonstrated the presence of different types of refugia and oases (natural and/or submerged water sources, highland zones with high precipitation rates, etc.) which certainly facilitated the settlement or mobility of human groups during arid and hyper-arid periods. Moreover, marriage between the fields of archaeology and palaeogenetics have enabled researchers to identify regions where the persistence of ancient haplogroups amongst current populations could explain the resilience of cultures and autochthonous traditions during the late prehistoric periods, despite the intensification of human interactions during the Holocene.

The objective in addressing this theme is therefore to define and to develop:

1- a typology of refugia and oases;
2- the application of the concept of refugia and niche-construction to archaeology;
3- the identification of niches using material culture and palaeogenetic data.

THEME 2
Refugia and oases: economic, social and political niches

Far from being isolated spaces, refuge zones and oases have long operated as the principal way-stations of exchange, and of commercial and pilgrimage routes in arid regions. They are economic hubs that have acted as transit points and channeling centers for raw materials, commercial goods and technological innovations over time. The exploitation of refugia, like the construction of oases, both shaped by their water resources, have influenced the alignment of trade routes and vice versa.

The objective in addressing this theme is therefore to consider the interaction between exchange networks and the development of these socio-environmental niches over the long term (ex. the development of the caravan trade routes and the impact of commercial maritime routes). Within this diachronic perspective, we are interested in the impact of social and/or political transformations on the dynamics and durability of these niches (ex. the integration of an oasis within a regional or macro-regional political entity, whether state-run or not).

THEME 3
From refugia to oases: from natural to constructed niches

Refuge zones, like oases, have been exploited and transformed due to the combined effect of the needs of populations, the availability of water resources and of technological and social capacities. This third theme aims to establish the dynamics of these spaces, and specifically in terms of natural spaces that are progressively impacted by humans.

One focus of this theme will be the hydrological and climatic context in which human communities developed, with the objective of understanding the evolution of resource availability, and its exploitation over the long term. We aim to better understand the transformation of these spaces into food production systems. If the presence of water resources conditions exploitation of refugia starting in prehistory, then it is human action that shapes, even creates, oases.

One sub-theme will focus on the reconstruction of agricultural, pastoral, and hydraulic technical systems, from the perspective of customs, spatial organization, species exploited and temporality (the past until now).

A second sub-theme will focus on the complex rules of management of these resources that are necessary for the durability of these niches. This theme puts into perspective past (literary and epigraphic sources) and current practices. Agricultural communities, which are heavily structured, develop in such a way as to manage the allocation of water and the maintenance of hydraulic systems. To what extent has the long-term social organization of agricultural communities influenced water management customs, and vice versa? What social and technological methods enabled populations to adapt to environmental changes?

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