PHILOSOPHICAL TRANSACTIONS B

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Review

Cite this article: Scheinsohn V, Muñoz AS, Mondini M. 2023 Climate change and long-term human behaviour in the Neotropics: an archaeological view from the Global South. *Phil. Trans. R. Soc. B* **378**: 20220403. https://doi.org/10.1098/rstb.2022.0403

Received: 15 March 2023
Accepted: 1 June 2023

One contribution of 13 to a theme issue 'Climate change adaptation needs a science of culture'.

Subject Areas:
behaviour, ecology, theoretical biology, evolution

Keywords:
long-term, archaeology, Niche Construction Theory, Global South, Neotropics, Holocene

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Climate change and long-term human behaviour in the Neotropics: an archaeological view from the Global South

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In this paper, we argue for the inclusion of archaeology in discussions about how humans have contributed to and dealt with climate change, especially in the long term. We suggest Niche Construction Theory as a suitable framework to that end. In order to take into account both human and environmental variability, we also advocate for a situated perspective that includes the Global South as a source of knowledge production, and the Neotropics as a relevant case study to consider. To illustrate this, we review the mid-Holocene Hypsithermal period in the southern Puna and continental Patagonia, both in southern South America, by assessing the challenges posed by this climate period and the archaeological signatures of the time from a Niche Construction Theory perspective. Finally, we emphasize the importance of these considerations for policymaking.

This article is part of the theme issue 'Climate change adaptation needs a science of culture'.

1. Introduction

The analysis of climate change and its implications needs a science of culture, as advocated in this special issue [1]. This is so because humans rely on culture as their primary means of tackling climate change, and also because they have long influenced climate with their behaviour ([2,3], among others). Then, the truism that the past is relevant to the present is less so in this case since, as in order to become aware and assess the magnitude of such change, there is a pressing need to contrast the present with the past. This may help not only to perceive climate change, but also to acknowledge that what we do in the present is deeply related to what our ancestors did before. In turn, it is also connected to the future and our descendants, who will bear the consequences of our actions and omissions, and those of the ongoing climate change.

Since the past is essential for discussing the implications of climate change, then archaeology definitely has a role to play ([3–5], among others). Archaeology, in a nutshell, is the study of human behaviour and culture and their interplay with the natural and social environments over time, based on the traces of human behaviour or material culture ([3,6,7], among others). It is a *métis* discipline, since it sits at the crossroads of social and natural sciences (figure 1) ([9,–12] and references therein). Archaeology is also a historical discipline. As such, it contributes to understanding the long-term relationships between climate and human behaviour at a scale not accessible from direct human experience, and yet crucial to comprehending climate change (e.g. [13]).

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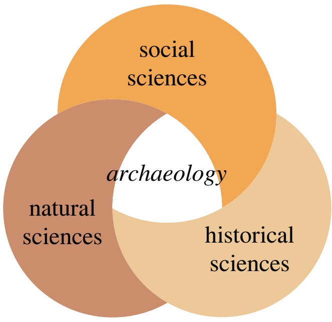

Figure 1. Archaeology as a *métis* discipline redrawn from [8]. (Online version in colour.)

On considering the climate–human interplay in space and time, significant variation is observed on a global scale, not just in terms of environments and cultures, but also in terms of academics and geopolitics and, thus, in the ways it is perceived. In this paper, we focus on the Neotropics, which is the region stretching from southern North America to southern South America ([14]; also see [15,16]; figure 2). This biogeographical region has some physical, ecological, cultural and historical characteristics that are unique, as described below ([17,18], among others). However, it is rather underrepresented in international academia as compared to 'central' countries, both as a case study and as a source of locally produced knowledge.

The goals of this paper are: (i) to show that archaeology can and should inform on the ways humans have played a part in and dealt with climate change over time, particularly in the light of Niche Construction Theory (hereafter, NCT), and (ii) to contribute a situated perspective on this matter, specifically from southern South America, both in a geopolitical sense—based on the characteristics of the Global South—and in an empirical one—based on the particularities of Neotropical environments and peoples. We will illustrate both issues with a regional case study, that of the Middle Holocene in the southern Puna and continental Patagonia (figure 2). We will evaluate the Hypsithermal climate period and concomitant environmental changes, as well as the archaeological signatures of human behaviour in both regions, and interpret the latter under the light of NCT.

2. Archaeology, Niche Construction Theory and the long-term

Processes relating to the experiences of climate change have varying temporal scales, including that of lifetime experience, the transgenerational one and the evolutionary one. Although anthropology has been dealing with climate change and its social consequences for some time, only historical disciplines, enabling a long-term perspective, can acknowledge their ultimate causes and their effects in the long run [19]. By studying the material record resulting from behaviours that involve actions and decisions whose consequences occur over time, transcending generations, archaeology is a key discipline with the ability to deal with processes at different scales, including the long term [20]. This latter scale does not imply a mere succession or addition of short-term episodes, but has its own dynamics—just like climate. Addressing these issues requires understanding the feedback between climate, environment, genetics and culture as mediated by niche construction.

NCT emphasizes the ability of organisms to modify their environment and, therefore, influence their own evolution and that of other species [21]. Niche construction implies time-transgressive effects that become modified sources of selection after the lifetime of the agents, and in this context, acquired traits can also become a source of selective pressures. Thus, causality of evolutionary change is not limited to selective pressures from the environment, but also includes those from constructed niches. Similarly, inheritance includes not just the genetic and cultural ones, but the so-called ecological one as well ([21] and references therein).

Humans are specialized in niche construction, as they count on culture as the main strategy. This has long been recognized in archaeology, both explicitly ([22,23], among others) and implicitly under different terminologies, such as the 'transmitted environment' by Boyd & Richerson ([24], also see [25])—see Ingold [26] for a different approach to learning as an intergenerational life process. By accounting for the material record of human behaviours, archaeology can help understand the contexts and relationships within which they have taken place [27]. It can also address the conditions under which niches become unstable and trigger cultural change and concomitant niche transformation, as well as demographic change and even the extinction of particular populations [28]. As climate change is a key factor linked to instability, the contribution of archaeology is thus crucial to account for the consequences of such change.

The archaeological record provides evidence of both the intended and the unintended consequences of our behaviours. As in genetics, the conscious and unconscious modifications by one generation impose restrictions and options on the next, while demographics influence the possibility of innovations emerging and being socially transmitted ([29], among others). In some instances, the unintended effects of human behaviours become unanticipated emergents and exaptations [30].

The relationship between human behaviours and climate-mediated environments has been addressed in archaeology from different standpoints, from the so-called environmental determinism at one end of the range to the absolute prevalence of human agency at the other ([28,31,32], among others). Many of these approaches oversimplify the complex interactions involved [33]. NCT, instead, allows us to address such complexity and transcend both environmental determinism or adaptationism and human agency or *emic* standpoints. It also overcomes the traditional Western dichotomy between nature and culture, by regarding nature as a constituent part of ourselves rather than an externality, and humans as a constituent part of nature.

Archaeology can thus address the factors involved in niche construction in a methodologically robust way ([34,35], among others). Yet, despite its potential, our discipline was called late into the discussion on climate change, and has had little participation in the institutions involved in its study and mitigation policies [3,5,20]. Specifically, while archaeological evidence has sometimes been taken into account, the discipline has not been a source of explanatory frames of reference so as to drive research agendas regarding climate change dynamics and their relation to social phenomena. As a consequence, processes that have greater temporal depth have seldom been considered, in spite of their crucial bearing.

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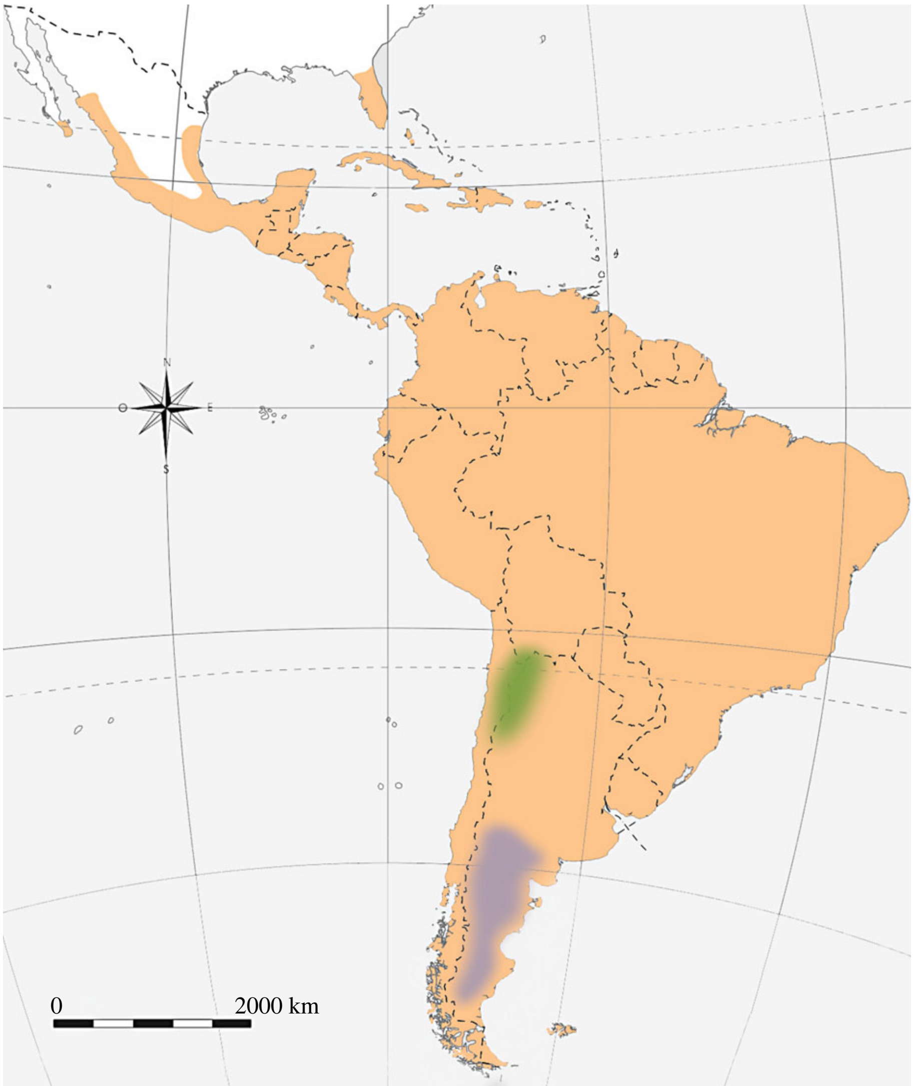

Figure 2. The Neotropics (orange/lighter shaded area) and the case studies considered in this paper: the southern Andean Puna (green/northern darker shaded area) and the steppes of continental Patagonia (purple/southern darker shaded area). (Online version in colour.)

3. The Global South perspective

The relationship between human societies and climate cannot be considered as a simple response of the former to changes in climatic conditions or their environmental expression, nor can climate be considered as a factor merely restricting the range of human decisions. NCT has shown that initial conditions—both intrinsic and extrinsic to human populations—as well as the feedback between decisions, practices—conscious or unconscious—and the selective pressures generated by their effects, are key to building historical narratives (*sensu* [36]) that recognize the specificity of historical and evolutionary trajectories. Although some structural properties are constant and can be generalized—such as the functioning of cultural niche construction in different human societies—the specific trajectories they assume under different conditions are unique. Hence, it is crucial to assess the variability and complexity of interactions between human societies and climate at different scales, times and places.

In order to propose an interpretive framework that recognizes human–climate relationships and their variability, it is essential to expand both the approaches and the case studies. That is, on the one hand, it is necessary to critically review the way in which scientific knowledge is currently produced and circulated. And on the other hand, it is necessary to address the empirical variability at different scales throughout time and space, including trajectories not represented in the same way elsewhere, like those in the Neotropics.

As to the variability in knowledge construction, research produced in the Global South has some specificities. The Global South—to a large extent coincident with the regions long considered the Third World, the Underdeveloped countries or the Periphery, as opposed to 'central' countries—is in fact a polythetic category. The origin of the asymmetry between highly industrialized countries and the Global South lies in the process of colonial expansion during the Modern era, since what the countries making up the region have in common is, basically, that they were once colonies [37].

In academic communities from the Global North, scholarly production from the Global South is seldom recognized, even by some Northern researchers working there. There is a linguistic aspect to this, since most of this production is in languages other than English, although more structural biases have been proposed to account for such omissions (see [38,39], among others).

This is also the case in archaeology in particular. For example, a controversial and audacious hypothesis was recently proposed by researchers from the Global North: that canoe Fuegians were the first humans to settle the Malvinas islands[1] [40]. The hypothesis was launched in spite of evidence at odds with it from previous archaeological research in the adjacent areas (southern Patagonia and Tierra del Fuego), suggesting that Fuegian canoe people could not navigate far away from the coast. There is plenty of academic literature about this, although it is not mentioned in the text. While most regional archaeological literature on the topic is in Spanish and authored by Argentinean and Chilean researchers, none of the 61 references cited in Hamley *et al*. [40] is in this language, and only four of the archaeologically themed articles have at least one Argentinian author. Had local literature been considered, a wealth of evidence against the proposed hypothesis would have become apparent (see, for instance, [41]).

These and other issues concerning the asymmetries between scientific research in the Global North and the Global South have recently been dealt with by Ruelas Inzunza *et al*. [39]. Among these issues are a restricted view of research topics, cost of publication, language hegemony, under-representation on editorial boards and as lead authors, lack of attention to ethics of collaboration and citation, burdensome technical and analytical expectation, and difficulties in maintaining regional open-access journals. Furthermore, besides disregarding relevant research originated in the Global South—at the expense of scientific rigour—models from the Global North are often applied in an uncritical fashion to case studies in the Southern Hemisphere, where they may not be relevant and may overshadow the particularities of the region ([18,42], and references therein). For instance, North Atlantic climatic events are not only out of phase with those of the Southern Hemisphere, but often display a different, even opposite climate signal [43,44]. As shown below, cultural interactions with climate differ as well.

Asymmetries between the Global North and the Global South are difficult to overcome, partly because some are inherently material, such as differential access to research resources. Yet, other asymmetries can be dealt with, and there are several pathways to tackle them from a theoretical standpoint. Some favour developing new, post-colonial theoretical frameworks in academia and beyond, including indigenous views, while others favour critically reasoning and applying theories and models already existing in academia, and that are considered of universal scope, from a situated perspective. Among the former, in spite of archaeology entering late the colonial and modernity critique [45], there are currently many efforts to decolonize archaeological research ([46–51], among others). In Latin America, most are included in the so-called *giro decolonial* (e.g. [52]), the colonial critique (e.g. [53]), perspectivism (e.g. [54]) and the *modernity/coloniality research program* of social sciences [55], based on the works of Walter Mignolo, Arturo Escobar and Aníbal Quijano. There are many Latin American archaeological works included in this framework, like those by Haber [56,57], Curtoni *et al*. [58], Gnecco & Langebaek [59], among others.

Our proposal, instead, is of the second kind mentioned above, that is, it seeks to critically apply existing theories and models from a situated perspective, while bearing on post-colonial developments as a sort of epistemological surveillance (*sensu* Bourdieu *et al*. [60]). We consider that NCT, as properly applied, has the potential to generate relevant historical narratives that are context-specific and that are crucial to overcome the aforementioned asymmetries, and feed the discussions on the implications of climate change upon human societies and the policies involved. Taking into account the whole range of variation in human adaptive capacity and vulnerability can also help overcome asymmetries and biases, and avoid reproducing climate coloniality (*sensu* [61]). To illustrate the potential of this approach, we are introducing a Neotropical case study below.

4. Humans and climate change in the Neotropics

In this section, we review the archaeological signal contemporary to the Middle Holocene Hypsithermal climatic period in southern South America, based on the literature, as an example of how the cultural aspects of long-term niche construction in the face of climate change can be interpreted from a Global South perspective. Specifically, we will focus on the southern Puna highlands in the Andes (hereafter referred to as Puna) and the steppes of continental Patagonia (hereafter referred to as Patagonia), both in the arid Neotropics (figure 2).

The Neotropical biogeographic region, *lato sensu*, ranges from southern North America and to the whole of Central and South America. The South American subcontinent in particular presents singular physical characteristics, such as considerable oceanity as compared to other continents—given the peninsular shape of the landmass in a namely marine hemisphere; the great diversity of environments over short distances on the western flank of the landmass—due to the altitudinal contrast throughout the Andes cordillera and surrounding areas; and the absence of prominent orographic barriers affecting dispersals across latitudinal bands [17]. Also, it bears a long history of isolation, which lasted until the Isthmus of Panama formed in the final Pliocene [62]. The Neotropical region is characterized by particular properties of its biota as well, which is very different from that in which our species evolved. After the Great American Biotic Interchange, which started when the Isthmus of Panama bridged South and North America, the Neotropical biota underwent huge changes which implied that several ecological niches were occupied by new species, while some other remained vacant [63,64]. Since the Pleistocene extinctions, the region presents a low saturation of large mammalian species [65].

Just like Central America represents a filter, South America represents a *cul de sac* for the dispersal of humans and other terrestrial organisms. This was the last continental landmass to be settled by hunter–gatherers in the Pleistocene [66,67]. Thus, the temporal scale of human impacts in this subcontinent is shorter as compared with the so-called Old World and even to Australia, particularly as regards the timing of coevolutionary processes with predators and prey. Furthermore, humans entering the Neotropics did not have any interspecific relationships with other hominins. These conditions, along with those mentioned above, favoured a wider human food niche in the Late Pleistocene, and the local domestication of different animal and plant species later on [19]. Altogether, these historical and ecological conditions are key to understanding the environmentally mediated impacts of humans on climate since their entering the Neotropics in the Late Pleistocene, as well as the impacts of climate change on human populations and on niche construction—and the possibilities of niche heritability in particular—in the region.

Two initial conditions were particularly relevant for human niche construction in the Neotropics:

(i) Humans entered the region as *Homo sapiens* after having colonized Eurasia, Beringia and Palearctic North America. These colonization processes occurred once *H. sapiens* populations experienced a number of cognitive, reproductive and social changes implied in the emergence of behavioural complexity [68]. The expression of this complexity is context-dependent, as it is conditioned by demographic, social and environmental aspects ([68], and references therein). An important implication of the capabilities involved in complex behaviour is that the human mind can be regarded as an extended one, which implies a 'distributed cognition' among individuals [67]. In our view, this may not only increase horizontal transmission, but also help increase heritability, a critical aspect of human niche construction.

(ii) On entering the Neotropics during the Late Pleistocene, humans encountered a new area with high environmental diversity, which was furthermore undergoing major climate-driven changes derived from the Glacial–Interglacial transition. These environmental changes and instability during the Late Pleistocene and the Pleistocene/Holocene transition would not have had a significantly negative impact on human populations, however, since they were in the process of adjusting to new environments at the time [66].

The Neotropical environments, along with conditions intrinsic to the human populations at the time, such as low population size and density, enabled broadly opportunistic strategies, involving multiple resources—including Pleistocene and modern faunas—and environments—comprising open landscapes, rainforests, etc. Under these conditions, the exploitation of Pleistocene megafauna was just one of the options for these foragers. Hence, the disruption of the food chains produced by the extinction of megafauna would not have had a major impact on human populations [66].

The ecological conditions humans found in the Neotropical region allowed an early, fast expansion of niche construction strategies. Since at least the onset of the Holocene, the archaeological record of South America offers clear evidence of significant human modification of environments, of magnitudes varying from local impacts to the creation of long-lasting regional anthropogenic landscapes. This was accomplished through practices such as fire use and deforestation in the northern South American forests, followed by early agriculture and intensive and long-term use of deforested areas ([69,70], among others). The Amazonian rainforests were also ecologically transformed since the Early Holocene ([71,72], among others). In both areas, these processes implied landscape domestication and the domestication of an array of plant species by the Late Holocene.

In arid South America, camelid populations were abundant in the Late Pleistocene and expanded even more after the megafaunal extinctions—which in fact included some camelid taxa—thus becoming available in various environments [73,74]. This was partly a result of their flexible behaviour. In the open landscapes of Puna and Patagonia, early hunter–gatherers relied on camelids as part of their opportunistic strategies, including the extant guanaco (*Lama guanicoe*) and vicuña (*Vicugna vicugna*)—the latter being restricted to the Puna. In Patagonia, guanacos were their main prey, and the now extinct horse and mylodon, as well as plants, were also part of the human diet [66]. In the Puna, on the other hand, there is no unambiguous evidence of megafauna exploitation so far, and other taxa such as rodents played a part in the Early Holocene diet, even as the preferred prey in some cases [75].

Conditions such as camelids becoming the ecologically dominant large herbivores since Pleistocene extinctions [65,73,74], as well as improved knowledge of the environment by human populations, prompted Puna and Patagonian hunter–gatherers to progressively focus on them as their staple prey [75,76]. Partly as a result of Pleistocene extinctions, exploited faunal diversity in Patagonia had decreased by the Early Holocene, with a concomitant increase of guanaco exploitation. Guanaco populations grew fast in southern Patagonia at the time, suggesting that the dispersal and density of humans was coupled with guanaco demography [77,78]. In the Puna, while in some areas there was a strong focus on camelids from early on, in others, where rodents were also exploited, camelid specialization arose somewhat later. In either case, coevolutionary relationships developed between humans and camelids in both regions [79]. Yet, as discussed below, divergent trajectories eventually arose in these two regions. In the Puna, it led to the domestication of the llama (*Lama glama*), along with an intensified exploitation of wild camelids. In Patagonia, instead, an intensified exploitation of the guanaco took place.

As regards human demography, estimations have been made for the South-Central Andes—including the southern Puna—and two areas of Patagonia—north-west and south, including the interior steppe—based on radiocarbon dates and mitochondrial DNA as proxies of changes in population size and absolute population size, respectively [80,81]. Both lines of evidence suggest earlier population growth in the South-Central Andes as compared to Patagonian areas, resulting in a much higher population density by the Late Holocene. Besides, connectivity among populations enabled extended information and resource networks in the Puna since at least the Early Holocene, as evidenced by raw materials and manufactured items from places as far as the lowland forests and the Pacific coast ([82], among others).

Later on, during the Middle Holocene, the Hypsithermal or Holocene Climate Optimum took place between *ca* 8300 and 5000 sidereal yBP. This was a warm period defined as a semi-formal interval and as a global phenomenon [83]. Both in the Puna and in Patagonia, significant aridization occurred, with concomitant lower productivity and landscape rearrangement [84]. Regarding the impacts of Hypsithermal conditions on human societies in the arid Neotropics, archaeologists have suggested that hunter–gatherer populations decreased their residential mobility, residential camps became tethered to areas with access to permanent water, and more logistical strategies were developed.

During this period, a marked depopulation—often referred to as an 'archaeological silence' [85]—is inferred in most of the Puna, implying the abandonment of sites and localities that were occupied during the Early Holocene, except for certain favourable places—namely those with stable access to permanent water—also referred to as ecorefugia [85,86]. In these benign settings, the convergence of humans and camelids would have prompted an intensified coevolutionary trajectory, including protective herding and, eventually, llama domestication since about 6000 cal BP [87]. The southern Andes has been proposed as an independent centre of camelid domestication, apart from the Central Andes [75,88]. This process required a long period of experimentation, cultural transmission and a suitable demographic setting enabling intergenerational heritability of landscapes and practices, as was available here since the Early Holocene. In spite of the restrictions imposed by the Hypsithermal, geographical and demographic conditions still allowed the heritability of constructed niches in the Puna.

Similarly to the Puna, the archaeological record of Middle Holocene Patagonia is also sparse. Some Patagonian areas have little evidence of human occupation during this time, suggesting local population decrease and change of settlement areas [80]. As in the Puna, it has been proposed that during drier periods, areas with water, faunal resources, firewood and shelter availability, such as lower basins, would have been privileged for settlement (e.g. [89]). This would have led to reduced residential mobility and population concentration in those environmental sectors, from which logistical and seasonal movements would have taken place [90].

On comparing Puna and Patagonia, in spite of roughly similar initial conditions as regards climate and available prey, human–camelid interactions took different pathways after the Hypsithermal. Besides some ecological differences—including latitude, altitude and total area covered by each of these regions—we propose that the key to such differential trajectories was demography and its bearing on cultural transmission. Female effective population size in the Southern Andes would have been about twice the size of that of Patagonia at the onset of the Holocene [81]. Besides, it would have experienced rapid growth in the former area, beginning as early as 9000 radiocarbon yBP, while growth would have been slower and started later in Patagonia. By the Late Holocene, absolute population size would have been fifteen times larger in the South-Central Andes than in north-west Patagonia, and two times larger in the latter region than in southern Patagonia [81].

In Patagonia, the conditions for maintaining information networks above the local scale—which had developed since early times and contributed to the initial exploration of the territory [66]—would have become difficult in the Middle Holocene. This would have been due to a more heterogeneous distribution of critical resources in the demographic context described above, which implied larger distances between resources and social groups. As a consequence, conditions for the emergence and successful transmission of innovations via niche construction would have been rather difficult. In the Puna, by contrast, demography allowed the maintenance and transmission of constructed niches, including interactions with camelids, even during the Hypsithermal. Thus, the very emergence of domestication would have to do with previous demographic circumstances that differed in both areas as preceding conditions. In turn, the differential effects of the incorporation of domestic resources would have amplified the divergence of the trajectories of the compared populations due to effects of contrasting niche construction.

Differential demographic conditions would have affected the opportunities for niche construction, since generation of innovations, tracking information across social networks, and the transmission of information and heritable traits in general are density-dependent and require network connectivity. These different ecological and demographic settings under globally changing climatic conditions during the Hypsithermal in the two regions led to divergent trajectories: while some previously occupied areas were abandoned and residential mobility was reduced in both regions, a process of domestication was only triggered in the Puna. Lower human densities and longer distances to resources and to other people in Patagonia would have favoured a long-lasting forager way of life.

While Hypsithermal climate change correlates with significant cultural change in the reviewed areas, considering niche construction is essential to grasp the ultimate causes. To do so, in turn, it is necessary to account for initial conditions, including those that impinge upon innovation rates and, especially, transgenerational heritability, as well as the selective pressures imposed by successive generations.

5. Discussion and implications for policymaking

The interplay between climate and human behaviour, as mediated by niche-constructed environments, is complex, and they can affect one another. Climate change has strongly influenced human niche construction, while humans, in turn, have impacted environments and landscapes to a large scale, thus leading to significant changes in Earth climatic variables. The archaeological record in fact shows that different human societies have led to a substantial modification of landscapes, and have affected animal and plant biodiversity and distribution and, indirectly, climate as well [2,28]. These and other processes have occurred at different spatial and temporal scales, generally across numerous generations, and are inherent to our species.

NCT contributes to understanding the entanglement of the so-called natural and social systems and of the short- and long-term scales, and allows overcoming the mere correlation of climate change and cultural responses, as shown in the Neotropical examples mentioned above. Landscapes are not just stages but constructs, even cultural ones (e.g. [32]). Humans are members of the broader biotic communities that we coevolve with, and do not merely react to climatically driven environmental changes. It has traditionally been considered that when certain changes in the archaeological record are correlated with environmental and/or climatic changes, the latter are the ultimate cause of the former. Hence, correlation has been viewed as causation. But cultural change should not necessarily be expected after any climatic trigger, since long-term inherited niches could act as buffers and still offer some options in the face of changing conditions, partly depending on the characteristics of the climatic change and on intrinsic properties of human societies, like demographic conditions. Furthermore, inherited niches are themselves a source of change, by imposing modified selective pressures to further generations. To sum up, NCT allows transcending mere correlation and reaching explanation.

Archaeology is in a unique position to address the different time scales involved in niche construction, from the ethnographic to the evolutionary ones, and the multiple spatial scales from local to global as well. It has a concern for interdisciplinarity and is well-equipped to comprehend the connections between human behaviour, history, environments and long-term climate change. By resourcing to NCT, archaeology can also contribute to the paradigm shift implied by the Anthropocene, a concept which must be framed from an authentically transdisciplinary perspective ([91] and references therein). Archaeology can also contribute to present-day policymaking, since in order to understand the ecological and environmental problems that the global human population is currently facing and to assess their future projections, we must understand the roots, history and variability of the processes that we have generated on the planet [92]. Those roots lay in the past, and thus the past can also shed light on possible solutions [93]. To the damage caused by the loss of biological diversity in the Anthropocene, we need to add the loss of cultural diversity in our species [3], as it implies erasing technological memories and cultural knowledge from the human repertoire. Yet, as the consequences of human niche construction have deep temporal roots, archaeology can help get some insight into this repertoire [35,94].

Here we have provided an example of the insights that NCT can offer to archaeological research and its contribution to the study of climate change. This approach allowed us to account for initial conditions, including those that affect innovation rates and, especially, trans-generational heritability, as well as the selective pressures imposed by successive generations. Density-dependent conditions favouring the emergence of cultural innovations and their heritability in the face of the Hypsithermal climate change differed in Puna and Patagonia, thus triggering two different trajectories. Hence, the way human societies adapt—or do not adapt—to new climatic challenges partly depends on these environmental and demographic initial conditions—among others—and on the available cultural repertoire.

On reviewing the case of the Hypsithermal in Puna and Patagonia, we relied mostly on local archaeological literature and reinterpreted it in terms of niche construction. This production, under the light of NCT, allowed us to regard the process of domestication in the southern Puna without relying exclusively on universal or general models, but considering the specifics of the case in a historical narrative. NCT and the long-term perspective of the entanglement of humans, landscapes, environments and climate that archaeology can help elicit are key to historical narratives such as the one introduced here on human–camelid interactions. It may also help overcome some biases deeply rooted in climate change research and policies, such as a strong human-centric bias, where anthropic causation by human behaviour is overemphasized [95] and, alternatively, the view of humans as merely exogenous factors, as is common in disciplines like ecology and conservation biology, instead of considering them as an integral part of ecosystems and landscapes [96]. Both extremes fail to recognize the interweaving of social and natural spheres.

Population vulnerability is not only a present condition, but is a historical one [97]. Thus, archaeology can help understand vulnerability since it provides a deep time perspective on diverse human–environmental interactions and forms of human resilience [61]. Historical narratives can teach us how vulnerable societies were before and after climatic disasters, what role cultural constraints played in long-term adaptation to climate variability, how multiple exposures to climate distress may weaken societal resilience, and the fact that different communities may have their own tools for facing climate change ([3,20,98], among others). This approach may also help us realize that what is right for humans at one moment may not be so—and could even be dangerous—at another, and that what is right in certain parts of the globe may not necessarily work in others.

We have presented this historical narrative on the selected Neotropical case study, as interpreted under the light of NCT, from a perspective situated in the Global South. Sometimes the so-called post-colonialist theoretical approaches are regarded as the only way to produce situated knowledge. Instead, we consider that our proposal is situated in the Global South in the sense that we have been formed and do research in the region, and from that perspective, we think critically about theoretical postulates conceived as more or less universal in scope, no matter where they were originally developed. Furthermore, while case studies from the Global South have often been considered in debates over archaeology and climate change, scholarly production from the Global South on the subject has been largely ignored. Scientific production generated in the region is seldom considered by researchers from the Global North investigating in the Global South, either because it is in a language different from English—which we do not consider a strong justification—or due to more structural factors, such as not considering it relevant enough (see [38,39,99], among others). While we agree with Mizoguchi [100] that there is not a homogeneous theoretical discourse in archaeology at present, this does not mean that the theoretical production from the Global South is well known.

To sum up, considering particular historical narratives from a long-term perspective contributes to our understanding of the role of culture in climate change debates and policies. NCT, in turn, contributes to addressing those issues from an enriched perspective that avoids regarding culture as an entity separate from environments and climate and humans as mere external actors. It also helps transcend mere correlations to deal with ultimate causation, and acknowledges that human behaviour acts upon and gets feedback from other Earth systems like the biosphere and atmosphere—and beyond—at various spatial and temporal scales. Finally, a Global South standpoint allows us to consider not just the variability involved in human interplay with climate change, but also that involved in academic cultures, and representing an array of perspectives beyond the anglosphere, from which global phenomena and issues may be more thoroughly understood.

Data accessibility. This article has no additional data.

Authors' contributions. V.S.: conceptualization, funding acquisition, investigation, writing—original draft, writing—review and editing; A.S.M.: conceptualization, funding acquisition, investigation, writing—original draft, writing—review and editing; M.M.: conceptualization, funding acquisition, investigation, writing—original draft, writing—review and editing.

All authors gave final approval for publication and agreed to be held accountable for the work performed therein.

Conflict of interest declaration. We declare we have no competing interests.

Funding. This research was partly funded by a grant from the Universidad Nacional de Córdoba (grant nos 33620190100017CB, Res. SECyT-UNC 233-20), one from CONICET (grant nos PIP 2022-2024 11220210100654CO) and two from Agencia I+D+i (grant nos PICT 2021 0444 and PICT 2021 1072).

Acknowledgements. We are deeply grateful to the guest editors, Anne Pisor, Kate Magargal and Steve Lansing. Also to two anonymous reviewers, who helped improve the text. We would like to recognize Daiana Coll and Ana Forlano, who kindly made figures 1 and 2, respectively.

Endnote

[1]Known as the Falklands by the British.

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