

On Domestication: Interview with Marcelo R. Sánchez-Villagra



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Marcelo R. Sánchez-Villagra is a professor of paleobiology and is the director of the paleontological Institute and Museum at the University of Zurich. He is widely published in his field and is the author of several books. His most recent book, *The Process of Animal Domestication*, presents a broad synthesis of this subject, from the rich biology behind the initial stages of domestication to how the creation of breeds reflects cultural and societal transformations that have impacted the biosphere.

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We would like to start the conversation by looking at how domestication has often been perceived as a unidirectional process. Humans throughout history have, in fact, frequently celebrated domestication as a symbol of dominance over nature. This anthropocentric perspective did not consider biological, cultural, and contextual components. Differently, in your work, you suggest that domestication processes should be examined in conjunction with those of other species rather than in isolation. Can you elaborate on this, and explain further how and why domestication started?

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In recent years there has been a paradigm shift in, or a different perspective on how we understand domestication, in terms of realising that humans could not control and predict how their relationship would evolve throughout domestication. Especially at the beginning of the domestication process, around 11,000 years ago, a form of self-domestication of these species often took place, as they approached humans for their own benefit and interest, and vice versa. Out of these first interactions a more intense relationship developed. Occasionally, these relations have grown with greater human control, an example of this is today's industrialization, despite being a recent phenomenon. What we have learned from different disciplines, such as biology or anthropology, is that humans are just one part, one side of the story, and that some of these animal and plant species have benefited as much or have driven as much of domestication as we have. However, it would be naive or incorrect to state that humans have been passive actors in this process. We have had a significant influence on the fate of many of these populations and species. According to current taxonomies, some recently domesticated animals are considered new species, and this can only be attributed to human activity, as the changes in the biology leading to the taxonomic separation are the result of intensive and directed selection for traits by humans. Depending on the place and time, there are differences in these kinds of interactions too, and this is where anthropology studies, and ontological

perspectives are significant. There are continents in which fewer species have originally been domesticated. This has surely to do not only with biology, but also with the type of interactions that humans in those places decided to establish with the local fauna—interactions such as ones of management of free populations, without intervening in the natural reproductive cycles or conditions of life. For instance, why have certain Eurasian species been domesticated, such as the domestic sheep, and not others, like deer, present in the Americas? This is a crucial question as the domestication of animals is generally considered as deeply influential for the development of human civilizations—just think of the horse, the sheep, or the cow. The biological suitability of an animal for domestication alone does not provide a complete picture of its domestication history. Certain wild canids native to the Americas, such as the coyote (*Canis latrans*), would have been biologically suitable for domestication but were not domesticated by humans. There is a possibility that humans in the Americas did not domesticate animals not because they were not close to them, but rather because they chose not to do so. They might not have been *interested* in creating a strongly dependent relationship with other animal species, thus not developing any form of co-domestication with them, due to a conception of their interactions with animals that is different to the one we are accustomed to today. This is also connected to their understanding of the world and their relation to other organisms, their “ontologies.” There has been much progress in understanding those ontologies, in order to grasp human diversity in terms of interactions that we have had with other organisms. Understanding the beginnings of domestication in many species is very challenging, because we have to go back in time and try to reconstruct climatic, demographic, and societal conditions that we can only approximate with archaeological methods. It is clear that in the interactions that happened in the initial process of domestication, there could not have been a knowledge of what they could have become, since these animals’ behaviour, as well as their morphology, was so different. Eventually some changes occurred, and over long periods of time people came to realise that there were some ways of exploitation or use of resources from these animals, and that their biology was suitable for those developments. Today, this of course raises ethical questions regarding our interactions with these animal populations.

FF While Darwin’s milestone *On the Origin of Species* begins with domestication, your book *The Process of Animal Domestication* raises the sense of condescension that grew in the scientific community towards domesticated animals. For instance, you look into zoological collections as a setting where often domesticated species are ignored. Could you outline the evolution of the definition of domestication?

MS Defining domestication is not such a trivial task, as there are many animals and plants, such as dogs, cats, sheep, cattle, wheat, peas, and corn, that have been domesticated and that we agree are domestic. We—the scientific community—have an intuitive notion of this, yet it is challenging to define it, since what we consider domestic has also changed over time. In medieval Europe, for example, animals that were living in people’s houses—in the *domus*—were considered domestic, but in fact some of these species are now no longer considered as such.¹ Our perception of the subject has changed because we have come to understand that it is not just a human controlled process, but rather an interaction in which animals or plants have a say. It is a continuous process involving different levels of intensity and types of interactions, and given this complexity, it is difficult to pinpoint a precise definition of it. It is important to note that there are many types of interactions that organisms have with each other: some are beneficial for both (e.g. rumen bacteria that live in the digestive tract of cows and help digest the plants they consume), while others are beneficial only for one (some animal eating human food trash or a bird making a nest on a tree). Since domestication is a form of interaction, in which categories should we place it? This is an issue of categorization that we often encounter in many academic disciplines, as we try to put something that is difficult to categorise in a box. Domestication can be classified as mutualism, a relationship beneficial to both species, as facultative symbiosis, where different species or populations decide to participate in the interaction, or as an obligatory relation, in which the nature of the interaction has changed so that one species or population is dependent on another. Such interactions are therefore very fluid, as they may be defined as symbioses or other types of interactions depending on the place and phase in which they have happened.

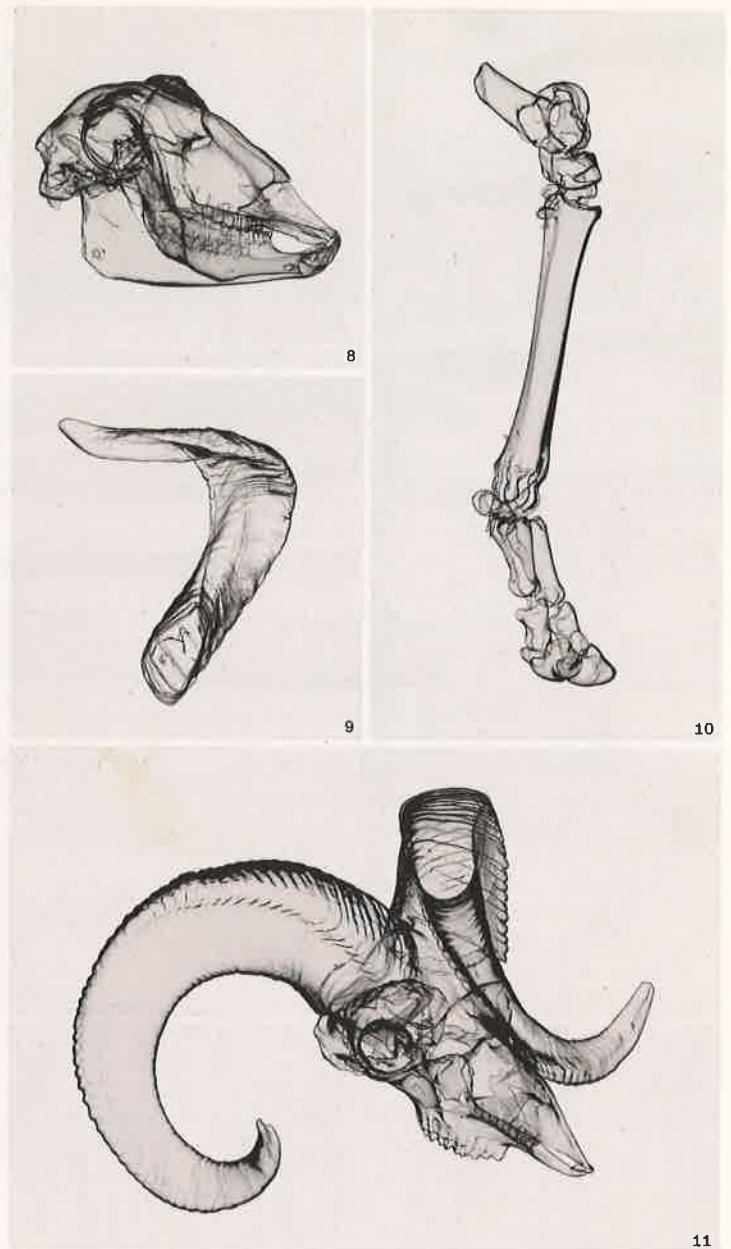
FF Traditionally, domestication has been defined from the human perspective, with the human species as the domesticator. This view is no longer universally accepted, as new perspectives of symbiosis and mutualism have entered the conversation. Domestication is now “perceived as an ongoing process rather than an invention or an event” as you say. Given its nonlinearity and the presence of multiple perspectives, is it possible to reconstruct the history of domestication? Moreover, why were certain species domesticated, and others not?

MS Reconstructing the history of domestic species is analogous to reconstructing, say, human history or the history of some human populations. Depending on the perspective you take or what you decide to emphasise, you can come up with a different narrative of aspects that you can study. In the case of domestic organisms, in particular animals, developments in

disciplines such as genetics, archaeology, and biology, has allowed us to better understand the biological changes that occur within domestication. These signs can therefore be found in the genetic record, as well as in the morphological record, for example, in the bones and teeth, of these animals. We can then put together information on the habitats in which these animals lived and their interactions, to get an overall picture of the domestication process that took place. However, like any discipline concerned with the past, there are problems of sampling and problems of preservation that make this history often incomplete. By integrating different disciplines, we are more likely to derive a picture, or a narrative, that is closer to reality, and that helps us comprehend when these interactions originated, as well as their nature. I have been interested in and discussed the issue of why certain species became domesticated, while others were not. It is a challenging question as the reasons cannot be just biological, and therefore cultural aspects and diverse ontological perspectives of different human populations are important. In the Amazon, for example, Amerindians² have had very strong interactions with plenty of animals that they kept as pets, such as several species of monkeys and birds such as parrots. These “pets,” however, are not considered domestic in any current definition of the word, as many of these species have not been truly *domesticated*—in that their biology has not been modified. Why is this? The causes cannot be purely biological, as many of these animals do have the features that make them suitable for domestication.³ There have been unsuccessful attempts to domesticate other species that are not currently domesticated, such as antelopes and zebras. Some animals have been tamed but not really domesticated, as is the case of elephants and many other species that have lived in proximity to humans. Nevertheless, they have not modified their biology, their reproductive biology in particular, as to be considered domestic—following the current definition that we use in biology, one that includes heritable changes in reproductive biology following the first phase of tameness, in the case of animals.

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Domesticated animals are often portrayed as lesser than wild animals. This can be observed in scientific and non-scientific literature, as well as in naturalistic documentaries or animal conservation policies. An example of this is the effort to protect wolf species in the mountainous areas of Italy, in order to preserve wilderness, thus contributing to the endangering of domesticated species, such as local sheep breeds. Similarly, in scientific research there is often a conceptual correlation between the loss of “wild” biological traits and the perception that such animals are less capable than their wild counterparts. Considering these premises, could you



1-4 Formafantasma, work in progress of animal reproductions at Ecofauna's workshop, 2023, Prato, Italy.
 5-7 Marcelo R. Sánchez-Villegas, 2022, Paleontological Inst. & Museum, University of Zürich.
 8-9 Formafantasma, digital elaboration of 3D scanned sheep skull and horn, 2022.
 10 Formafantasma, digital elaboration of 3D scanned sheep leg, 2022.
 11 Formafantasma, digital elaboration of 3D scanned mouflon skull, 2022.

elaborate on the concept of “domestication syndrome”?

MS There has been a repeated discussion on the so-called domestication syndrome, that is a suite of characters which presumably appear in many domesticated species independently. The question has been what these characters are, and if there is a common mechanism behind their origin. These characters include changes in pigmentation in the colour of the animals, changes in their entanglement, such as hairs in mammals or feathers in birds, or a reduction in the brain size. There seems to be some truth to this, but at the same time it is not a universal theory, as not all species have responded to the selection in the domestication process in the same way. A new perspective from developmental biology considers the ontogeny of these characteristics, how they form and why they do so during growth, until adult form. This is where commonalities might exist among different species. Analogous selection regimes might have produced similar features, due to the common thread of developmental biology that all these species—humans included—share. There is an ongoing discussion between biologists, in which some seem to emphasise more the commonalities, whereas others seem to emphasise the lack of universals in this regard. This discussion has been fruitful in that people have tried to concentrate on studying species more carefully, trying to understand the complexities of domestication processes and the results of, for example, the selection of tameness, or of physiological traits. One of the patterns that we have discovered and studied in domesticated species is that brain size appears to have decreased all across different species, and the question is why. Although there is a trivial and simple correlation between brain size and intelligence, it is not that domesticated species are less intelligent, clearly there is something else at play. It is possible that there was a reduction in brain size associated with some functions that were less important to domestic animals than they were to wild animals, as there may have been a development of some collective intelligence that resulted in each individual having a smaller brain. One aspect that is rather important is the fact that the brain is a very expensive tissue to produce. It makes sense physiologically to reduce its size from an optimisation perspective, which is a way for any organism alive to conserve energy. No domestic species or domestic population is optimal, as there are compromises, or characteristics that are sub-optimal by the way evolution works. Surely this is something to take into account when considering any trait—including the reduction of brain size—but there is also a repeated pattern, and this requires further exploration.

FF When speaking about wool production, merino sheep are now virtually the only breed used for the production of wool, resulting in the extinction or near extinction of many other breeds once valuable for their fleece. This is the consequence of a process of industrial “optimisation” of wool

production. In light of this, how do you envision the future of domesticated species?

MS Predicting the future of domesticated populations of animals is surely difficult, but we can look back and see what has happened in the last decades. There has been, of course, more industrialization, and with that the loss of many breeds and land races. Some of the biological and cultural heritage of previous domestication processes has been lost in many parts of the world, but at the moment there is an increasing awareness around this issue. There are indeed many local attempts to recover some of these land races and breeds when possible. On the one hand, I think we can predict a future in which these efforts will bring fruits, and where we will see animals or populations that were almost disappearing, showing a wonderful diversity of morphology and genes, with strong cultural ties to some of the people that bred these animals. On the other hand, industrialization, a growing population, and the pressure to produce more and more meat or any other product from domesticated animals, will perhaps increase the concentration of some specific breeds and the practice of genetic manipulation. The global situation is difficult to predict, as various developments are taking place in different regions. Reaching common goals that benefit all will certainly be a challenge for humanity.

- 1 Examples include mostly birds, such as the common blackbird (*Turdus merula*), the magpie, and the common raven (both *Corvidae*) and sparrowhawks (*Accipiter nisus*).
- 2 Amerindian refers to the indigenous, endemic populations of the American continent, that were predated through the Columbian exchange that started in the 15th century, and of which there are surviving populations today.
- 3 Features such as diet, growth rate, reproductive traits, and social structure, among others have to meet specific parameters which are considered as necessary for an animal to be domesticated.