

PLOS Science Wednesday: Hi Reddit, my name is Israel and through phylogenetics, I identified a new species and genus of palaeomerycids from Spain, *Xenokeryx amidalae* – Ask Me Anything!

PLOSScienceWednesday¹ and r/Science AMAs¹

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April 17, 2023

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CORRESPONDENCE:

DATE RECEIVED:
October 20, 2016

DOI:
10.15200/winn.147687.77861

ARCHIVED:
October 19, 2016

CITATION:
PLOSscienceWednesday ,
r/Science , PLOS Science
Wednesday: Hi Reddit, my
name is Israel and through
phylogenetics, I identified a
new species and genus of
palaeomerycids from Spain,
Xenokeryx amidalae – Ask Me
Anything!, *The Winnower*
3:e147687.77861 , 2016 , DOI:
[10.15200/winn.147687.77861](https://doi.org/10.15200/winn.147687.77861)

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In his book guns, germs and steel, Jared Diamond discussed the characteristics that made a species a good candidate for domestication. In most of the world, megafauna that didn't meet these criteria have been mostly wiped out. Africa retains the most diverse sets of undomesticatable species, with numerous antelope and giraffe populations. Is there anything in phylogenetically to suggest why so many mega fauna species persist in Africa when they don't in other parts of the world

--EDIT--

?

[shiningPate](#)

Human pressure, I guess. Africa is a huge continent, not so populated during a long time of its history. But when humans appear in great numbers wild animals disappear, and that is currently happening in Africa since the late XIX century...

How has the genomics era improved (or perhaps complicated) the field of phylogenetics? How do you actually decide whether or not an organism is a new species versus an individual of an existing species?

[ag_sci14](#)

Genomics have added a very important source of data to the morphological studies. DNA and peptide sequencing are going to impulse new discoveries in the next decade. Paleontological species are a bit different to living species. Basically the fossil data are incomplete, and the intraspecific variability is usually unavailable due to the lack of abundant fossil specimens. A paleontological species must be a terminal taxon with consistent autapomorphies. Fossil populations are a rare discovery in the fossil record. Here in Spain we have two of these unique examples when variability within single populations of extinct organisms can be studied: Cerro de los Batallones (Upper Miocene; Madrid) and Sima de los Huesos (Middle Pleistocene; Burgos).

What is the next species/taxa that you are planning to study phylogenetically? Are there any species whose phylogenetic positions you doubt currently?

[semaj009](#)

I am currently studying two groups, moschids (musk-deer) and tragulids. I made my PhD on moschids. Regarding musk-deer my main points of interest are both the phylogeny of *Micromeryx* and the early evolution of *Moschus* (the extant musk-deer) lineage. Tragulids are a very primitive group of non-pecoran ruminants that still have extant representatives and almost nothing is known about their phylogenetic relationships. ☺ They are very problematic and because that they are great ☺ And regarding pecorans in general there is still a lot of work to do. Stem pecorans and cervidomorphs are two obvious targets.

For those of us considering pursuing Paleontology/Paleobiology, what is your pros/cons list?

[Orisno](#)

Pros and cons? Well, I think the pros are, in my opinion, that you are seeing things that no one has seen before, and really travelling to long-gone worlds with strange creatures that have a lot of mysteries for you to resolve: how they evolved, how they lived in their long-gone environments, what were the processes that molded those ancient versions of Earth. You know, 'to boldly go where no one has gone before' ☺ The cons... the cons probably depend on the country you live. Here in Spain the science and research have been brutally undermined and many research teams in paleontology are in danger. You must be prepared to go from one grant / contract to another with really not much stability in your life, at least during a long time. And you need to publish and publish and publish... It is not an easy career, but is there an easy one out there?

As a Spaniard aspiring to be a future researcher (albeit in a different field), do you think science and investigation are in a good spot in Spain right now? If not, what are we missing?

[SpanishDuke](#)

Science and research in Spain are going downhill into a very deep pit. No money, no consistent research planning, no postdoc grants, no nothing. Money wasted in forming researchers whose career is later cut and terminated, people has to migrate and produce science away from here. Winter is coming.

If you had a time machine that can only be used once, which time of earth history would you travel to and what would you look at?

[SvanteArrheniusAMA](#)

Though question... Only one shot? I would probably go to the final Cretaceous xD I would look for some *T. rex* ☺

As someone who is studying biology in a Catalan university and has a huge interest in paleobiology, is it easy to find a job in this field?

[Golokopitenko](#)

No, it is not easy. In Spain is becoming almost impossible to do research on paleontology. Sorry for being so realistic. Lets hope this situation changes... but it does not look good. ☹

A recent paper that received news focus indicated giraffes, formerly considered a single species, were in fact four separate species. It seems the definition of what is and is not a species has blurred in recent years due to examination of genetic evidence. As an example there was recent move to delist the American red wolf as a species. This gives the impression species definition has become somewhat subjective. What are the objective criteria phylogenetics uses to declare a population as a separate species, or in the case of the red wolf, retract a species designation?

[shiningPate](#)

The paper in question is Fennessy et al 2016, the 4 species are based upon DNA analysis of 7 different nuclear loci. I don't think the word is 'blurred'. More inquisitive studies can reveal more differences (or lack of them) than previously thought. Genetic separation is one criterion used with extant organisms. A paleontological species (really my field) must be a taxon with consistent autapomorphies. However, there is room for interpretation, if you refer to that.

Thank you for doing this AMA! I am one of the PLOS Paleo Community editors and I have a question! Xenokeryx has really bizarre antlers/horns. Do you think that they had a purpose besides sexual selection? Do the fossils show any pathologies on these antlers that may have been related to fighting or any other possible behaviors?

[gombessagirl](#)

Yes, I suspect that palaeomerycid headgear could be used for male-to-male combat. But we have no direct evidence on this. We have not studied possible pathologies yet, but we have a new research on the take off runway that involves palaeomerycid 'horns'. We will try to look for evidence of combat-related pathologies similar to those present in modern giraffes.

1. How much is understood about population interactivity vs. RIMs (Reproductive isolating mechanisms) at the time these species were thriving in Europe?
2. Are there enough samples across time and space to get an idea of population movement and dynamics?
3. What elements of cladistics (or other non-genetic analysis) were applied, or was speciation of *Xenokeryx amidalea* strictly genetic?

edit: Congratulations on the paper!

[Biomirth](#)

Thanks! It is difficult to study population dynamics if you do not have a population... Sadly, most fossils including Xenokeryx sample are composed by parts of different individuals or a single (usually incomplete) specimen. Also, palaeomerycids are not so deeply study (at least so far) to start doing that kind of research.

Hi thanks for this ama! I'm curious about how you chose MacClade for the phylogenetic analysis. Also which program would you recommend for a beginner in systematics?

[orange400](#)

Hi! We used MacClade for compiling data and for reconstructing morphological changes. If you want to make Maximum Parsimony your best bet is TNT, in my opinion...

How did you go about documenting a new species? Did you sequence the genome of the animal to find differences with other giraffes? Who did you tell upon discovering that this was a separate species?

[missingstardust](#)

We work mainly with fossils. We describe the morphological characters and complete the phylogenetic matrix. Depending of our results we can discuss creating new species. In the case of Xenokeryx we performed a total-evidence tip-dating analysis that also included DNA from the extant terminals. Our molecular data comes from GenBank ;)

How do you feel about Lumping vs. Splitting? How about Subspecies concepts? I've always found the logic to be quite poor to name something based on bad evidence (e.g. one morphological character and no phylogenetic evidence). There are those that would argue that subspecies represent ESU's, but even that nomenclature presupposes an evolutionary trajectory, which is unpredictable.

I also want to ask you about species naming. When I did my masters degree I found it incredibly annoying when species (or subspecies) were named after people rather than something useful like a unique morphological characteristic. I'm presuming that you named your species after Amidala because of her hairstyle resembling their horns, in which case it passes my "usefulness" criterion. How do you feel about this?

[polychaos](#)

You have to follow evidence and be honest with your results. If you have to split, do it so. Fossil subspecies is a thing that I do not consider. The dedication to Amidala follows your usefulness criterion, yes, the name is after the famous hairstyle she wears in Coruscant when young Anakin goes to her room to say goodbye. With a popular image we describe an anatomical structure. However sometimes there are people who deserve being honored with a species.

Good morning! I'm currently working and looking to finally go to College. I have a huge interest in Biology and want to go into Evolutionary Biology and work with Phylogenetics in the future, so I'd like to ask: 1.) How did you get interested in biology? 2.) Do you have any tips for someone looking to start studying into the field and do similar work? 3.) How did you begin working with the ICP-Miquel Crusafont and what's one thing you love and hate about your work?

Sorry for the slew of questions, I haven't actually had the chance to talk with someone working within the phylogenetics field before. Thank you for your time! :)

[Pravosudie](#)

Hi! 1- Since I was a child I was interested in nature, animals in general and later in dinosaurs. I am a biologist, as well as many other biologists of my age, thanks to a TV program called 'El Hombre y la Tierra' (The Mankind and the Earth) and its conductor Félix Rodríguez de la Fuente. Félix's programs introduced to a broad audience the concepts of natural history and conservation in the early-middle 70s. Before I learned to read I knew the names of many animals thanks to his program. Félix created in us, the kids that were, a deep love for nature, and he is the reason why I got interested in zoology. 2-

My tip is to enjoy this work whenever you can dedicate to it. Have an open mind, get rid of preconceptions and develop a critic mind. 3- I have collaborated with members of the ICP since long time ago. I recently got linked to them as a associate researcher. Paleontologists from MNCN (Madrid) and ICP (Barcelona) have a long history of association, we are the two main big groups involved in Tertiary mammals here in Spain.

- Is there any good justification to use paraphyletic classifications in taxonomy, or is it mainly based on tradition and convenience?
- Are all Apes "[Old World Monkeys](#)"?

[metalliska](#)

No, there is no evolutionary justification for that. Is no sense.

In my understanding Apes=hominids (Hylobates, Pongo, Gorilla, Pan and Homo).

What is involved in phylogenetic analyses? Is it mostly DNA? How do you determine how far a species is from another?

[looks_at_lines](#)

It depends on what you are analyzing. With fossils and extant forms in the same analysis the morphological characters are more numerous, molecular data can come from nuclear - mitochondrial DNA and RNA sources.

Not a question about your discoveries (Although it tickles me), how did you become involved with the Field? What courses did you take? And how long it took you? I am torn between becoming a Historian or a Paleontologist, and getting at least some insight with one even from a far would help

[ArmoredSpearhead](#)

I am a Biologist. But I like History a lot. These two fields are beautiful but unrelated. I took paleontology specialization courses.

Do you think bovids will continue to dominate herbivore niches as they do now or will they eventually be sidelined by another group? Also, do you think Sivatherium survived until relatively recently?

[Isovenator](#)

Bovids are probably the more plastic of the modern pecorans. I do not know but they seem to be though to displace. There was some evidence of a sivatheriine sumerian figurine but it is controversial!

Completely unrelated, but as someone who struggles with his email/word processor's spell check due to scientific nomenclature. What's your work around for that?

[julbull73](#)

Patience, my young Padawan... ;)

Were you always interested in this field of science?

[imthewiseguy](#)

Probably yes, I always loved paleontology. And I like phylogenetics, is what I enjoy more of doing paleontology.

what are your secret plans for reviving extinct giraffoid species?

plug for [/r/giraffe](#)

[arbivark](#)

I will use the Kaminoan cloning facilities ;)

What are the implications of the extinct palaeomerycids being giraffomorphs rather than Cervids? Does this mean that other giraffomorph species could potentially have populated wider ranges of the Eurasian continent? Are there any evolutionary theories to explain the predominance of two antlered ruminant species over three and four antlers? Is there evidence of a sort of "antler Pre-Cambrian explosion" before evolution decided the two antler pattern was the most biologically efficient antler pattern?

[shiningPate](#)

The main implications are that giraffomorphs are a large and ancient group with complex biogeographic and evolutionary relationships. Yes, other giraffomorphs could have populated wider ranges of Eurasia but the only ones that we know to be strictly Eurasian are the palaeomerycids. Cranial appendages in ruminants appear as almost autapomorphic traits at the family level, with some exception. True antlers and proto-antlers are always two (in cervids and stem-cervids). However, multi-horned pecorans have appeared several times in parallel: palaeomerycids, giraffids, dromomerycids and hoplitomerycids.

Why did you name them something that's impossible to say?

[D_rotic](#)

There are worse fossils than Xenokeryx in that respect. Just check out some Chinese dinosaurs ;)

Do you like Okapis? Where do they play a role in all of this, if at all?

Also, any recommendations for an extinct megafauna textbook for starters? I study pronghorn antelope in North America, and would like to read more about other (now extinct) Antilocapridae.

[dead-serious](#)

Yes, okapis are great. Check Ríos et al. 2016 for a preliminary phylogenetic position of the okapi among giraffids. For antilocaprids and other North American macro fauna: Janis et al (1998). Evolution of Tertiary Mammals of North America. Cambridge University Press. And if you can, visit the AMNH-New York ;)

