

An accessible solution for paleocoordinate calculation

Noa Scholz^{1,2,3}, Alejandro Rodriguez-Mena^{1,2}, Víctor Madarnás-Gómez^{1,2}, Antonio Monleón-Getino^{1,2}

¹ BIoST3, Research Group in Biostatistics, Data Science and Bioinformatics, Barcelona, Spain.

² Department of Genetics, Microbiology and Statistics, Faculty of Biology, Universitat de Barcelona (UB), Barcelona, Spain.

³ Institut de Recerca de la Biodiversitat (IRBio), Universitat de Barcelona (UB), Barcelona, Spain.

Corresponding author: E-mail: scholz@ub.edu (N. S.)

Bibliographic References for PACA Validation

Allosaurus fragilis

Marsh, O. C. (1877). Notice of new dinosaurian reptiles from the Jurassic formation. *American Journal of Science*, s3-14(84), 514-516 <https://doi.org/10.2475/ajs.s3-14.84.514>

Hunt, A. P., Lucas, S. G., Krainer, K., & Spielmann, J. A. (2006). The taphonomy of the Cleveland-Lloyd Dinosaur Quarry, Upper Jurassic Morrison Formation, Utah: A re-evaluation. In J. R. Foster & S. G. Lucas (Eds.), *Paleontology and Geology of the Upper Jurassic Morrison Formation* (New Mexico Museum of Natural History and Science Bulletin 36, pp. 57-65).

Anomalocaris canadensis

Whiteaves, J. F. (1892). Description of a New Genus and Species of Phyllocarid Crustacea from the Middle Cambrian of Mount Stephen, B.C. *The Canadian Record of Science*, 5(4), 205-208.

Whittington, H. B., & Briggs, D. E. G. (1985). The largest Cambrian animal, *Anomalocaris*, Burgess Shale, British-Columbia. *Philosophical Transactions of the Royal Society of London. B, Biological Sciences*, 309(1141), 569-609 <https://doi.org/10.1098/rstb.1985.0096>

Archaeopteryx lithographica

von Meyer, H. (1861). *Archaeopteryx lithographica* (Vogel-Feder) und *Pterodactylus* von Solenhofen. *Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefakten-Kunde*, 1861, 678-679.

Kundrát, M., Nudds, J., Kear, B. P., Lü, J., & Ahlberg, P. (2019). The first specimen of *Archaeopteryx* from the Upper Jurassic Mörnsheim Formation of Germany. *Historical Biology*, 31(1), 3-63 <https://doi.org/10.1080/08912963.2018.1518443>

Argentavis magnificens

Campbell, K. E., & Tonni, E. P. (1980). A new genus of teratorn from the Huayquerian of Argentina (Aves: Teratornithidae). *Contributions in Science, Natural History Museum of Los Angeles County*, 330, 59-68 <https://doi.org/10.5962/p.208145>

Cenizo, M. M., Tambussi, C. P., & Montalvo, C. I. (2011). Late Miocene continental birds from the Cerro Azul Formation in the Pampean region (central-southern Argentina). *Alcheringa: An Australasian Journal of Palaeontology*, 36(1), 47-68 <https://doi.org/10.1080/03115518.2011.582806>

Argentinosaurus huinculensis

Bonaparte, J. F., & Coria, R. A. (1993). A new and huge titanosaur sauropod from the Rio Limay Formation (Albian-Cenomanian), of Neuquen Province, Argentina. *Ameghiniana*, 30(3), 271-282.

Garrido, A. C. (2010). Estratigrafía del Grupo Neuquén, Cretácico Superior de la Cuenca Neuquina (Argentina): nueva propuesta de ordenamiento litoestratigráfico. *Revista del Museo Argentino de Ciencias Naturales, nueva serie*, 12(2), 121-177.

Australopithecus afarensis

Johanson, D., & Taieb, M. (1976). Plio—Pleistocene hominid discoveries in Hadar, Ethiopia. *Nature*, 260, 293-297 <https://doi.org/10.1038/260293a0>

Basilosaurus isis

Zalmout, I. S., Mustafa, H. A., & Gingerich, P. D. (2000). Priabonian *Basilosaurus isis* (Cetacea) from the Wadi Esh-Shallala Formation: first marine mammal from the Eocene of Jordan. *Journal of Vertebrate Paleontology*, 20(1), 201-204 [https://doi.org/10.1671/0272-4634\(2000\)020\[0201:PBICFT\]2.0.CO;2](https://doi.org/10.1671/0272-4634(2000)020[0201:PBICFT]2.0.CO;2)

Brachiosaurus altithorax

Riggs, E. S. (1903). *Brachiosaurus altithorax*, the largest known dinosaur. *American Journal of Science*, s4-15(88), 299-306 <https://doi.org/10.2475/ajs.s4-15.88.299>

Taylor, M. P. (2011). Correction: A re-evaluation of *Brachiosaurus altithorax* Riggs, 1903 (Dinosauria, Sauropoda) and its generic separation from *Giraffatitan brancai* (Janensch, 1914). *Journal of Vertebrate Paleontology*, 31(3), 727 <https://doi.org/10.1080/02724634.2011.557115>

Cryolophosaurus ellioti

Hammer, W. R., & Hickerson, W. J. (1994). A Crested Theropod Dinosaur from Antarctica. *Science*, 264, 828-830 <https://doi.org/10.1126/science.264.5160.828>

Smith, N. D., Makovicky, P. J., Pol, D., Hammer, W. R., & Currie, P. J. (2007). The Dinosaurs of the Early Jurassic Hanson Formation of the Central Transantarctic Mountains: Phylogenetic Review and Synthesis. In A. Cooper, C. Raymond, & The 10th ISAES Editorial Team (Eds.), *Antarctica: A Keystone in a Changing World—Online Proceedings for the 10th International Symposium on Antarctic Earth Sciences* (USGS Open-File Report 2007-1047, Short Research Paper 003). U.S. Geological Survey <https://doi.org/10.3133/of2007-1047.srp003>

Elrathia kingii

Gaines, R. R., & Droser, M. L. (2003). Paleocology of the familiar trilobite *Elrathia kingii*: An early exaerobic zone inhabitant. *Geology*, 31(11), 941-944 <https://doi.org/10.1130/G19926.1>

Eoraptor lunensis

Sereno, P., Forster, C., Rogers, R., & Monetta, A. M. (1993). Primitive dinosaur skeleton from Argentina and the early evolution of Dinosauria. *Nature*, 361, 64-66 <https://doi.org/10.1038/361064a0>

Martínez, R. N., Alcober, O. A., & Colombi, C. E. (2011). A Basal Dinosaur from the Dawn of the Dinosaur Era in Southwestern Pangaea. *Science*, 331(6014), 206-210 <https://doi.org/10.1126/science.1198467>

Glossopteris bucklandensis

McLoughlin, S. (1990). Some Permian Glossopterid Fructifications and leaves from the Bowen Basin, Queensland, Australia. *Review of Palaeobotany and Palynology*, 62(1-2), 11-40
[https://doi.org/10.1016/0034-6667\(90\)90015-B](https://doi.org/10.1016/0034-6667(90)90015-B)

Hallucinochrysa diogenesi

Pérez-de la Fuente, R., Delclòs, X., Peñalver, E., Speranza, M., Wierzechos, J., Ascaso, C., & Engel, M. S. (2012). Early evolution and ecology of camouflage in insects. *Proceedings of the National Academy of Sciences*, 109(52), 21414-21419 <https://doi.org/10.1073/pnas.1213775110>

Homo erectus

Widianto, H., & Noerwidi, S. (2023). Long journey of Indonesian *Homo erectus*: Arrival and dispersal in Java Island. *L'Anthropologie*, 127(3), 103167 <https://doi.org/10.1016/j.anthro.2023.103167>

Ichthyosaurus communis

Conybeare, W. D. (1822). Additional Notices on the Fossil Genera *Ichthyosaurus* and *Plesiosaurus*. *Transactions of the Geological Society of London*, 1, 103-123.

Massare, J. A., & Lomax, D. R. (2018). A taxonomic reassessment of *Ichthyosaurus communis* and *I. intermedius* and a revised diagnosis for the genus. *Journal of Systematic Palaeontology*, 16(3), 263-277 <https://doi.org/10.1080/14772019.2017.1291116>

Inostrancevia alexandri

Golubev, V. K. (2000). The Faunal Assemblages of Permian Terrestrial Vertebrates from Eastern Europe. *Paleontological Journal*, 34(2), S211-S224.

Ochev, V. G., & Surkov, M. G. (2000). The history of excavation of Permo-Triassic vertebrates from Eastern Europe. In M. J. Benton, M. A. Shishkin, D. M. Unwin, & E. N. Kurochkin (Eds.), *The Age of Dinosaurs in Russia and Mongolia* (pp. 1-16) Cambridge University Press.

Lystrosaurus murrayi

Botha, J., & Smith, R. M. H. (2007). *Lystrosaurus* species composition across the Permo–Triassic boundary in the Karoo Basin of South Africa. *Lethaia*, 40(2), 125-137
<https://doi.org/10.1111/j.1502-3931.2007.00011.x>

Botha, J., Huttenlocker, A. K., Smith, R. M. H., Prevec, R., Viglietti, P., A. & Modesto, S. P. (2020). New geochemical and palaeontological data from the Permian-Triassic boundary in the South African Karoo Basin test the synchronicity of terrestrial and marine extinctions. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 540, 109467
<https://doi.org/10.1016/j.palaeo.2019.109467>

Botha, J. (2020). The paleobiology and paleoecology of South African *Lystrosaurus*. *PeerJ*, 8, e10408
<https://doi.org/10.7717/peerj.10408>

Smith, R. M. H., Botha, J., & Viglietti, P. A. (2022). Taphonomy of drought afflicted tetrapods in the Early Triassic Karoo Basin, South Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 604, 111207 <https://doi.org/10.1016/j.palaeo.2022.111207>

Meganeura monyi

Brongniart, C. (1893). *Recherches pour servir à l'histoire des insectes fossiles des temps primaires: précédées d'une étude sur la nervation des ailes des insectes*. G. Masson.

Kukalova, J. (1969). Revisional Study of the Order Palaeodictyoptera in the Upper Carboniferous Shales of Commentry, France. Part I. *Psyche: A Journal of Entomology*, 76(2), 163-215.
<https://doi.org/10.1155/1969/74019>

Moanasaurus mangahouangae

Wiffen, J. (1980). *Moanasaurus*, a new genus of marine reptile (Family Mosasauridae) from the Upper Cretaceous of North Island, New Zealand. *New Zealand Journal of Geology and Geophysics*, 23(4), 507-528 <https://doi.org/10.1080/00288306.1980.10424122>

Young, M. D., & Hannah, M. J. (2010). Dinoflagellate biostratigraphy of the vertebrate fossil-bearing Maungataniwha Sandstone, northwest Hawke's Bay, New Zealand. *New Zealand Journal of Geology and Geophysics*, 53(1), 81-87 <https://doi.org/10.1080/00288301003639742>

Mosasaurus hoffmannii

Faujas de Saint-Fond, B. (1799). *Histoire naturelle de la Montagne de Saint-Pierre de Maestricht*. H. J. Jansen.

Street, H. P., & Caldwell, M. W. (2017). Rediagnosis and redescription of *Mosasaurus hoffmannii* (Squamata: Mosasauridae) and an assessment of species assigned to the genus *Mosasaurus*. *Geological Magazine*, 154(3), 521-557 <https://doi.org/10.1017/S0016756816000236>

Otodus megalodon

Pimiento, C., González-Barba, G., Ehret, D. J., Hendy, A. J. W., MacFadden, B. J., & Jaramillo, C. (2013). Sharks and rays (Chondrichthyes, Elasmobranchii) from the late Miocene Gatun Formation of Panama. *Journal of Paleontology*, 87(5), 755-774 <https://doi.org/10.1666/12-117>

LeBlanc, J. (2021). Stratigraphic Lexicon: The Onshore Cenozoic Sedimentary Formations of The Republic of Panama. *Biosis: Biological Systems*, 2(1), 1-173
<https://doi.org/10.37819/biosis.002.01.0095>

Proplebeia dominicana

Poinar, G., Jr. (2016). Orchid pollinaria (Orchidaceae) attached to stingless bees (Hymenoptera: Apidae) in Dominican amber. *Neues Jahrbuch für Geologie und Paläontologie - Abhandlungen*, 279(3), 287-293 <https://doi.org/10.1127/njgpa/2016/0556>

Sinosauropteryx prima

Ji, Q., & Ji, S. (1996). On the discovery of the first bird-like dinosaur in China (*Sinosauropteryx* gen. nov.). *Geological Review*, 42(3), 196-200.

Chen, Pj., Dong, Zm., & Zhen, Sn. (1998). An exceptionally well-preserved theropod dinosaur from the Yixian Formation of China. *Nature*, 391, 147-152 <https://doi.org/10.1038/34356>

Zhou, Z. (2006). Evolutionary radiation of the Jehol Biota: chronological and ecological perspectives. *Geological Journal*, 41(3-4), 377-393 <https://doi.org/10.1002/gj.1045>

Tapejara wellnhoferi

Elgin, R. A., & Campos, H. B. N. (2012). A new specimen of the azhdarchoid pterosaur *Tapejara wellnhoferi*. *Historical Biology*, 24(6), 586-591
<https://doi.org/10.1080/08912963.2011.613467>

Prado, G. M. E. M., Anelli, L. E., Petri, S., & Romero, G. R. (2016). New occurrences of fossilized feathers: systematics and taphonomy of the Santana Formation of the Araripe Basin (Cretaceous), NE, Brazil. *PeerJ*, 4, e1916 <https://doi.org/10.7717/peerj.1916>

Thylacosmilus atrox

Forasiepi, A. M., MacPhee, R. D. E., & Hernández del Pino, S. (2019). Caudal cranium of *Thylacosmilus atrox* (Mammalia, Metatheria, Sparassodonta), a South American Predaceous Sabertooth. *Bulletin of the American Museum of Natural History*, 433, 1-66 <https://doi.org/10.1206/0003-0090.433.1.1>

Tiktaalik roseae

Daeschler, E. B., Shubin, N. H., & Jenkins, F. A., Jr. (2006). A Devonian tetrapod-like fish and the evolution of the tetrapod body plan. *Nature*, 440, 757-763 <https://doi.org/10.1038/nature04639>

Tyrannosaurus rex

Horner, J. R., Goodwin, M. B., & Myhrvold, N. (2011). Dinosaur Census Reveals Abundant *Tyrannosaurus* and Rare Ontogenetic Stages in the Upper Cretaceous Hell Creek Formation (Maastrichtian), Montana, USA. *PLoS ONE* 6(2), e16574 <https://doi.org/10.1371/journal.pone.0016574>

Velociraptor mongoliensis

Osborn, H. F. (1924). Three new Theropoda, Protoceratopsia, and Ornithopoda from the Mongolian Cretaceous. *American Museum Novitates*, 144, 1-12 <http://hdl.handle.net/2246/3223>

Dashzeveg, D., Dingus, L., Loope, D. B., Swisher, C. C., Dulam, T., & Sweeney, M. R. (2005). New Stratigraphic Subdivision, Depositional Environment, and Age Estimate for the Upper Cretaceous Djadokhta Formation, Southern Ulan Nur Basin, Mongolia. *American Museum Novitates*, 3498, 1-31 [https://doi.org/10.1206/0003-0082\(2005\)498\[0001:NSSDEA\]2.0.CO;2](https://doi.org/10.1206/0003-0082(2005)498[0001:NSSDEA]2.0.CO;2)

Xampylodon diastemacron

Otávio dos Santos, R., Riff, D., Ramos, R. R. C., Fernandes Rodrigues, I., Scheffler, S. M., Sucerquia, P. A., & de Araújo Carvalho, M. (2024). A new species of cow shark (Hexanchiformes: Hexanchidae) from the Late Cretaceous of Seymour Island, Antarctica. *Historical Biology*, 37(3), 517-528 <https://doi.org/10.1080/08912963.2024.2316047>

Greenwich Zero Meridian

International Meridian Conference. (1884). *International Conference Held at Washington for the Purpose of Fixing a Prime Meridian and a Universal Day. October, 1884*. Protocols of the Proceedings. Government Printing Office <https://www.gutenberg.org/files/17759/17759-h/17759-h.htm>