Mark Andrew Loewen

Curriculum Vitae

Department of Geology and Geophysics, University of Utah

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**Education**

Ph.D. Geology University of Utah 2009

M.Sc. Paleontology Loma Linda University 1999

B.A. Chemistry, minor Physics Union College 1994

**Appointments**

Associate Professor Lecturer: Department of Geology and Geophysics, Univ. of Utah 2016 – 2022

Adjunct Assistant Professor: Department of Geology and Geophysics, Univ. of Utah 2010 – 2016

Resident Research Associate: Natural History Museum of Utah, Univ. of Utah 2012 – 2022

Research Associate: Denver Museum of Nature and Science 2013 – 2021

Honorary Research Staff: Evolutionary Studies Institute, Univ. of the Witwatersrand 2013 – 2021

Exhibit Curator: Utah Museum of Natural History 2007 – 2014

Research Associate: Utah Museum of Natural History 2000 – 2011

Instructor: Department of Geology and Geophysics, University of Utah 2003 – 2010

Scientific Coordinator of Exhibits: Utah Museum of Natural History 2005 – 2007

Exhibits Consultant: Cleveland-Lloyd Dinosaur Quarry Interpretive Center, BLM 2004 – 2007

**Current Research Interests**

Dinosaur systematics and evolution within ankylosaurs, ceratopsians and tyrannosaurs

Late Cretaceous paleobiogeography, biostratigraphy, taphonomy and paleoecology

Intraspecific, interspecific and ontogenetic variation in dinosaurs

Dinosaur limb musculature and implications for anatomy, functional morphology and behavior

**Grants and Fellowships**

NSF 0819953: The Horned Dinosaur Radiation: Co-PI $149,998 2008 – 2013

NSF 0745454: Kaiparowits Basin Project: Co-PI $60,000 2008 – 2010

JSA045006: Cleveland-Lloyd Dinosaur Quarry excavation grant, BLM: $4,985 2006 – 2007

Teaching Fellowship: University of Utah, $19,000 2006 – 2007

Graduate Research Fellowship: University of Utah, $11,000 2004 – 2005

Jurassic Foundation Research Grants, $7,500 2004 – 2007

Robert Randolph Memorial Grant: University of Utah, $1,000 2004

University Teaching Assistant Fellowship: University of Utah, $12,800 2003 – 2005

Teaching Fellowship: Department of Biology, University of Utah, $6,000 2003

Student Research Grant: Geological Society of America, $900 2002

Marta Weeks Field Trip Stipend: University of Utah, $2,700 2001 – 2002

Summer Research Fellowship: University of Utah, $7,500 2000

Student Research Grant: Paleontological Society, $500 2000

Research Grant: Fossil Butte National Monument, $750 1998 – 1999

Selma Andrews Fellowship: Loma Linda University, $3,500 1995 – 1998

**Teaching Experience**

**Undergraduate Instruction university students instructed = 5883**

Departments of Geology and Geophysics and Biology, University of Utah

GEO 104/GEO 1040 World of Dinosaurs 2003 – 2022

BIOL 1006 World of Dinosaurs 2003 – 2017

GEO 1010 Exploring Earth 2016 – 2017

GEO 100/1000 Science in Cinema 2018 – 2022

GEO 1000 Natural Disasters 2015 – 2017

**High School Instruction high school students instructed = 241**

Department of Science and Math, Loma Linda Academy, Loma Linda, CA

Biology I 1995 – 1998

Algebra I 1998

**Graduate Teaching Assistant**

Department of Geology and Geophysics, University of Utah

GEO 1006 World of Dinosaurs 2001 – 2002

GEO 3180 Paleobiology 2000

GEO 3200 Natural Disasters 2005

GEO 5420 Advanced Vertebrate Paleontology and Evolution 2003

GEO 5760 Stratigraphy and Sedimentary Processes 1999 – 2000

Department of Biology, University of Utah

BIOL 3310 Comparative Vertebrate Morphology 2001

BIOL 5401 Vertebrate Paleontology and Evolution 2003

Department of Earth and Biological Sciences, Loma Linda University

GEOL 441 Sedimentology 1996

GEOL 556 Paleoenvironments 1996

GEOL 566 Advanced Sedimentology 1997

GEOL 567 Stratigraphy and Basin Analysis 1997

**Student Research Supervision**

**Undergraduate Research Projects undergraduate students supervised = 17**

Departments of Geology and Geophysics, University of Utah 2004 – 2022

**Graduate Committee Member graduate students advised = 3**

Departments of Geology and Geophysics, University of Utah 2011 – 2022

**Consulting and Professional Experience**

Scientific Consultant: Animal Weapons, filmed for the BBC 2016 – 2017

Scientific Advisor: “Dinosaur Expo 2016” National Science Museum, Tokyo 2015 – 2016

Scientific Advisor: “Dinosaur Expo 2012” National Science Museum, Tokyo 2011 – 2012

Scientific Consultant: Jurassic Fight Club, filmed for the History Channel 2007 – 2008

Scientific Consultant: Cleveland-Lloyd Dinosaur Quarry visitor center, BLM 2005 – 2007

Scientific Advisor: “Dinosaur Expo 2005” National Science Museum, Tokyo 2004 – 2005

Scientific Consultant: “Juvenile *Allosaurus* Mount” Western Paleo Laboratories 2002 – 2003

Exhibits Consultant: “Dinosaur Tales” exhibit, Utah Museum of Natural History 2002 – 2003

Paleontology Resource Consultant: Raytheon Engineering, Irvine, CA 1996 – 1997

Analytical Chemist: Harris Laboratories, Lincoln, NE 1993 – 1994

**Awards and Recognitions**

Outstanding Graduate Teaching Award: University of Utah 2008

Outstanding Teaching Assistant Award: University of Utah 2001

Dean’s Award (Highest Honor in M.S. Program): Loma Linda University 1999

Edmund C. Jaeger Book Award: Loma Linda University, $500 1997

Dean’s List: Loma Linda University 1999

**Ongoing Collaborative Research Projects**

Evolution and radiation of tyrannosauroid dinosaurs.

Radiation, diversity and evolution of horned dinosaurs from western North America.

Evolution and radiation of ankylosaurid dinosaurs.

Taxonomy, functional morphology and stratigraphic distribution of basal theropod dinosaurs.

Late Cretaceous interchange between Asia and North America.

Late Cretaceous vertebrates of the Kaiparowits and Wahweap formations.

**Paleontological Field Research**

Morrison Formation, (Jurassic), Cleveland-Lloyd Dinosaur Quarry, Utah 2001 – 2018

Kaiparowits, Wahweap and North Horn formations, (Cretaceous), GSENM, Utah 2000 – 2019

Wasatch, Green River, Bridger and Washakee formations, (Eocene), western U.S. 1994 – 2015

Mesa Verde Group, Evanston and Lance formations (Cretaceous), Wyoming 2004 – 2005

Turkana Grits Formation, (Cretaceous), northern Kenya 2004

Maevarano and Betsiboka formations, (Cretaceous and Cenozoic), Madagascar 2001 – 2003

Cuenca de Parras and Cerro del Pueblo formations, (Cretaceous), Coahilla, Mexico 2000 – 2002

Cedar Mountain Formation, (Cretaceous), Utah 2001

Paris Basin Group, (Oligocene), Avergane region, France 1999

Barstow Formation, (Miocene), California 1998

**Museum Research**

American Museum of Natural History, New York, NY

Brigham Young University Geology Museum, Provo, UT

British Museum of Natural History, London, England

Carnegie Museum of Natural History, Pittsburgh, PA

Denver Museum of Natural History, Denver, CO

Institute of Vertebrate Paleontology and Paleoanthropology, Beijing, China

Mesa Southwest Museum, Mesa, AZ

Museum of Comparative Zoology, Harvard University, Cambridge, MA

Museum of Northern Arizona, Flagstaff, AZ

Museum of the Rockies, Bozeman, MT

National Museum of Canada, Ottawa, ON

National Museum of Natural History, Smithsonian Institution, Washington, DC

New Mexico Museum of Natural History, Albuquerque, NM

Paleontological Museum of Uppsala, Uppsala, Sweden.

Peabody Museum of Natural History, Yale University, New Haven, CT

Raymond Alf Museum of Paleontology, Claremont, CA

Royal Ontario Museum, Toronto, ON

Royal Tyrrell Museum of Palaeontology, Drumheller, AB

Texas Memorial Museum, Austin, TX

University of Edmonton Museum of Paleontology, Edmonton, AB

**Research Papers**

**Loewen, M. A.**, and J. M. de Gibert Atienza. (In minor revision). A unique fish trail (*Undichna*) from the Eocene Green River Formation of Fossil Lake: paleoecological implications. PeerJ. 8:e7803 DOI 10.7717/peerj.7803

**Loewen, M. A.**, M. J. Ryan, and D. C. Evans. (In minor revision). A new centrosaurine dinosaur (Ornithischia: Ceratopsidae) from the lower Judith River Formation (Campanian) of northcentral Montana. PLoS One.

Hendrickx, C., P. R. Bell, M. Pittman, A. R. C. Milner, E. Cuesta, J. O’Connor, **M. A. Loewen,** P. J. Currie, O. Mateus, T. G. Kaye and R. Delcourt. 2022. Morphology and distribution of scales, dermal ossifications, and other non-feather epidermal structures in non-avialan theropod dinosaurs. Biological reviews of the Cambridge Philosophical Society, 2022-01-06

Smith, E. A., and **M. A.** **Loewen,** and J. I. Kirkland. 2020. New social insect nests from the Upper Jurassic Morrison Formation of Utah. Geology of the Intermountain West. P234-261.

Chure, D. J., and **M. A.** **Loewen,** 2020. Cranial anatomy of *Allosaurus jimmadseni*, a new species from the lower part of the Morrison Formation (Upper Jurassic) of Western North America. PeerJ.

Nesbitt, S. J., R. K. Denton, **M. A. Loewen**, S. L. Brusatte, N. D. Smith, A. H. Turner, J. I. Kirkland, A. T. McDonald and D. G. Wolfe. 2019. A mid-Cretaceous tyrannosauroid and the origin of North American end-Cretaceous dinosaur assemblages. Nature Ecology and Evolution 3:892–899.

Carrano, M. T., **M. A. Loewen**, and S. W. Evers. 2018. Comment on the proposed conservation of usage of *Allosaurus* Marsh, 1877 by designation of a neotype for its type species *Allosaurus fragilis* Marsh, 1877, (Case 3506; see BZN 67: 53–56, 178). Bulletin of Zoological Nomenclature.

Knapp, A., R. Knell, A. Farke, **M. A. Loewen,** D. Hone. 2018. Patterns of divergence in the morphology of ceratopsian dinosaurs: sympatry is not a driver of ornament evolution. Proceedings of the Royal Society B. 285:20180312. DOI: 10.1098/rspb.2018.0312

Chiba, K., M. J. Ryan, F. Fanti, **M. A. Loewen**, and D.C. Evans. 2017. New material and systematic re-evaluation of *Medusaceratops lokii* (Dinosauria: Ceratopsidae) from the Judith River Formation (Campanian, Montana). Journal of Paleontology. doi: 10.1017/jpa.2017.62

Ryan, M. J., R. Holmes, J. Mallon, **M. A. Loewen**, D. C. Evans. 2017. "A basal ceratopsid (Centrosaurinae: Nasutoceratopsini) from the Oldman Formation (Campanian) of Alberta, Canada". Canadian Journal of Earth Sciences. 54. doi:10.1139/cjes-2016-0110.

Tsolmon, A. C. L. Johnson, **M. A.** **Loewen**., K. A. Ritterbush, K. N. Constenius, C. M. Dinter. 2017. Microbial-caddisfly bioherm association from the Lower Cretaceous Shinekhudag Formation, Mongolia: Earliest record of plant armoring in fossil caddisfly cases. PLoS One. https://doi.org/10.1371/journal.pone.0188194

Lund, E. K., S. D. Sampson and **M. A. Loewen**. 2016. *Nasutoceratops* *titusi* (Ornithischia, Ceratopsidae), a basal centrosaurine ceratopsid from the Kaiparowits Formation, Southern Utah. Journal of Vertebrate Paleontology. DOI: 10.1080/02724634.2015.1071265.

Claessens L. P. A. M. and **M. A.** **Loewen**.2015, A redescription of *Ornithomimus velox* Marsh 1890 (Dinosauria, Theropoda) Journal of Vertebrate Paleontology. DOI:10.1080/02724634.2015.1034593.

Ryan, M. J., D. C. Evans, P. J. Currie, and **M. A. Loewen**. 2014. A new chasmosaurine from northern Laramidia expands frill disparity in ceratopsid dinosaurs. Naturwissenschalften doi:10.1007/s00114-014-1183-1

DeBlieux, D. D., J. I. Kirkland, T. A. Gates, J. G. Eaton, M. A. Getty, S. D. Sampson, **M. A. Loewen**, and M. C. Hayden. 2013. Paleontological Overview and Taphonomy of the Middle Campanian Wahweap Formation in Grand Staircase-Escalante National Monument. In A. L. Titus and M. A. Loewen, eds., At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 563-587.

Evans, D. C., T. Williamson, M. J. Ryan, **M. A. Loewen**, and J. I. Kirkland. 2013. A review of pachycephalosaurian dinosaurs from Grand Staircase-Escalante National Monument, southern Utah. In A. L. Titus and M. A. Loewen, eds., At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 482-487.

Kirkland, J. I., L. Alcalá, **M. A. Loewen**, E. Espílez, L. Mampel, J. P. Wiersma. 2013. The basal nodosaurid ankylosaur *Europelta carbonensis* n. gen., n. sp. from the Lower Cretaceous (lower Albian) Escucha Formation of northeastern Spain PLoS ONE 8(11): e79420. doi:10.1371/journal.pone.0080405

**Loewen, M. A.,** R. B. Irmis, J. J. W. Sertich, P. J. Currie and S. D. Sampson. 2013. Tyrant dinosaur evolution tracks the rise and fall of Late Cretaceous oceans. PLoS ONE 8(11): e79420. doi:10.1371/journal.pone.0079420

**Loewen, M. A.** A. A. Farke, S. D. Sampson, M. A. Getty, E. K. Lund and P. M. O’Connor. 2013. Ceratopsid dinosaurs from the Grand Staircase of southern Utah. In A. L. Titus and M. A. Loewen, eds., At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 488-503.

**Loewen, M. A.,** M. E. Burns, M. A. Getty, J. I. Kirkland and M. K. Vickaryous. 2013. Review of Late Cretaceous ankylosaurian dinosaurs from the Grand Staircase region, southern Utah. In A. L. Titus and M. A. Loewen, eds., At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 445-462.

Sampson, S. D., E. K. Lund, **M. A. Loewen**, A. A. Farke and K. E. Clayton. 2013. A remarkable short-snouted horned dinosaur from the Late Cretaceous (Campanian) of southern Utah. Proceedings of the Royal Society Biology 280:20131186. doi.org/10.1098/rspb.2013.1186

Sampson, S. D., **M. A. Loewen**, E. M. Roberts and M. A. Getty. 2013. A New Macrovertebrate Assemblage from the Late Cretaceous (Campanian) of Southern Utah. In A. L. Titus and M. A. Loewen, eds., At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 599-622.

Thomson, T. J., R. B. Irmis and **M. A. Loewen**. 2013. First occurrence of a tyrannosaurid dinosaur from the Mesaverde Group (Neslen Formation) of Utah: Implications for upper Campanian Laramidian biogeography, Cretaceous Research 43:70-79.

Wiersma, J. P. and **M. A. Loewen**. 2013. Taphonomy of a subadult *Teratophoneus curriei* (Tyrannosauridae) from the Upper Campanian Kaiparowits Formation of Utah. In A. L. Titus and M. A. Loewen, eds., At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 288-598.

Zanno, L. E, **M. A. Loewen**, A. A. Farke, G. Kim and L. P. A. M. Claessens and C. T. McGarrity. 2013. Late Cretaceous theropod dinosaurs of southern Utah. In A. L. Titus and M. A. Loewen, eds., At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 504-525.

Carrano, M. T., **M. A. Loewen** and J. J. W. Sertich. 2011. New materials of *Masiakasaurus knopfleri* Sampson, Carrano, and Forster, 2001 and implications for the morphology of the Noasauridae (Theropoda: Ceratosauria). Smithsonian Contributions to Paleobiology 95:1-53.

Farke, A. A., M. J. Ryan, P. M. Barrett, D. H. Tanke, D. R. Braman, **M. A. Loewen**, and M. R. Graham. 2011. A new centrosaurine from the Late Cretaceous of Alberta, Canada, and the evolution of parietal ornamentation in horned dinosaurs. Acta Palaeontologica Polonica. 56 (4):691-702. doi:10.4202/app.2010.0121.

Kirkland, J. I. and **M. A. Loewen**. 2011. Utah’s Prehistoric Tanks: the Ankylosaurs. Utah Geological Survey Notes. 43(3):4-5.

Gates, T. A., Sampson, S. D., L. E. Zanno, E. M. Roberts, J. G. Eaton, R. L Dydum, J. H. Hutchinson, J. A. Smith, **M. A. Loewen**, and M. A. Getty. 2010. Biogeography of terrestrial and freshwater vertebrates from the late Cretaceous (Campanian) Western Interior of North America. Palaeogeography, Palaeoclimatology, Palaeoecology 291:371-387.

Getty, M. A., **M. A. Loewen**, E. M. Roberts, A. L. Titus and S. D. Sampson. 2010. Taphonomy of horned dinosaurs (Ornithischia: Ceratopsidae) from the Late Campanian Kaiparowits Formation, Grand Staircase-Escalante National Monument, Utah, In: M. J. Ryan, B. J. Chinnery-Allgeier, and D. A. Eberth, eds., New Perspectives on Horned Dinosaurs: The Royal Tyrrell Museum Ceratopsian Symposium, Bloomington: Indiana University Press. 478 – 494.

**Loewen, M. A.** and D. J. Chure. 2010. Comment on the proposed conservation of usage of *Allosaurus* Marsh, 1877 by designation of a neotype for its type species *Allosaurus fragilis* Marsh, 1877, (Case 3506; see BZN 67: 53–56, 178). Bulletin of Zoological Nomenclature 67(3).

**Loewen, M. A.**, S. D. Sampson, E. K. Lund, A. A. Farke, C. de Leon, M. C. Aguillón Martínez, R. A. Rodríguez de la Rosa, M. A. Getty, and D. A. Eberth. 2010. Horned dinosaurs (Ornithischia: Ceratopsidae) from the Upper Cretaceous (Campanian) Cerro del Pueblo Formation, Coahuila, Mexico. In: M. J. Ryan, B. J. Chinnery-Allgeier, and D. A. Eberth, eds., New Perspectives on Horned Dinosaurs: The Royal Tyrrell Museum Ceratopsian Symposium, Bloomington: Indiana University Press. 99 – 116.

Sampson, S. D. and **M. A. Loewen**. 2010. Unraveling a radiation: a review of the diversity, stratigraphic distribution, biogeography, and evolution of horned dinosaurs (Ornithischia: Ceratopsidae), In: M. J. Ryan, B. J. Chinnery-Allgeier, and D. A. Eberth, eds., New Perspectives on Horned Dinosaurs: The Royal Tyrrell Museum Ceratopsian Symposium, Bloomington: Indiana University Press. 405 – 427.

Sampson, S. D., **M. A. Loewen**, A. A. Farke, E. M. Roberts, C. A. Forster, J. A. Smith, and A. L. Titus. 2010. New horned dinosaurs from Utah provide evidence for intracontinental dinosaur endemism. PLoS ONE 5(9):e12292.

Sertich, J. J. W., and **M. A. Loewen**. 2010. A New Basal Sauropodomorph Dinosaur from the Lower Jurassic Navajo Sandstone of Southern Utah. PLoS ONE, 5(3):e9789.

Sampson, S. D., T. A. Gates, E. M. Roberts, M. A. Getty, L. E. Zanno, A. L. Titus, **M. A. Loewen**, J. A. Smith, E. K. Lund and J. J. W. Sertich. 2010. Grand Staircase-Escalante National Monument: A new and critical window into the world of dinosaurs. In: Learning from the Land, Grand Staircase-Escalante National Monument Science Symposium Proceedings, Grand Staircase-Escalante Partners. 141-158.

Zanno, L. E., J. P. Wiersma, **M. A. Loewen**, S. D.Sampson, and M. A. Getty. 2010. A preliminary report on the theropod dinosaur fauna of the late Campanian Kaiparowits Formation, Grand Staircase-Escalante National Monument, Utah. In: Learning from the Land, Grand Staircase-Escalante National Monument Science Symposium Proceedings, Grand Staircase-Escalante Partners. 173-186.

Farke, A. A., S. D. Sampson, C. A. Forster and **M. A. Loewen**. 2009. *Turanoceratops tardabilis*—sister taxon, but not a ceratopsid. Naturwissenchaften 96:869-870.

Leggitt, V. L. and **M. A. Loewen**. 2007. Immature aquatic dipteran impressionspreserved in tufa: Eocene Fossil Lake, Wyoming, The Mountain Geologist, 44(2):1-7.

Leggitt, V. L., R. A. Cushman, **M. A. Loewen** and H. P. Buchheim. 2007. Caddisfly (Insecta: Trichoptera) cases used as unique autochthonous paleoenvironmental indicators: Eocene Lake Gosiute. The Mountain Geologist, 44(2):109-117.

Sampson, S. D. and **M. A. Loewen**. 2007. New information on the diversity, stratigraphic distribution, biogeography, and evolution of ceratopsid dinosaurs. Royal Tyrell Museum Ceratopsian Symposium Short Papers 125-133.

Getty, M. A., **M. A. Loewen**, A. L. Titus and S. D. Sampson. 2007. Ceratopsid taphonomy from the Kaiparowits Formation, Grand Staircase-Escalante National Monument, Utah. Royal Tyrell Museum Ceratopsian Symposium Short Papers 56-60.

Lund, E. K., **M. A. Loewen**, S. D. Sampson, M. A. Getty, M. C. Aguillón Martinez, R. A. Rodriguez de la Rosa and D. A. Eberth. 2007. Ceratopsian remains from the Late Cretaceous Cerro del Pueblo Formation, Coahuila, Mexico. Royal Tyrell Museum Ceratopsian Symposium Short Papers 108-113.

Sampson, S. D. and **M. A. Loewen**. 2005. *Tyrannosaurus rex* from the Upper Cretaceous (Maastrichtian) North Horn Formation of Utah: biogeographic and paleoecologic implications, Journal of Vertebrate Paleontology, 25(2):469-472.

Leggitt, V. L. and **M. A. Loewen**. 2002. Eocene Green River Formation “Oocardium tufa” reinterpreted as complex arrays of calcified caddisfly (Insecta: Trichoptera) larval cases, Sedimentary Geology, 148(1-2):139-146.

### Buchheim, H. P., V. L. Leggitt, R. E. Biaggi and M. A. Loewen. 1999. Paleoenvironments of avian trackway sites within the Olla Member, Palm Spring Formation, Anza-Borrego Desert State Park, Proceedings of the 1999 Desert Research Symposium, San Bernardino County Museum Association, 46(2):47-52.

**Loewen, M. A.**, V. L. Leggitt and H. P. Buchheim. 1999. Caddisfly (Trichoptera) larval cases from Fossil Lake, Eocene Green River Formation, Fossil Butte National Monument, Wyoming, National Park Service Technical Report NPS/NRGRD/GRDTR-99/03:72-77.

### Loewen, M. A. and H. P. Buchheim. 1998. Paleontology and paleoecology of the culminating phase of Eocene Fossil Lake, Fossil Butte National Monument, Wyoming. National Park Service Paleontological Research Volume 3:73-80.

**Edited Volume**

Titus, A. L and **M. A. Loewen**, 2013. At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah. Bloomington: Indiana University Press. 621 pp.

**First Authored Published Abstracts**

Loewen, M. A., J. J. W. Sertich, and M. A. Norell. 2018. The presence of multiple lineages of tyrannosaurs in the Upper Jurassic Morrison Formation, USA demonstrate early cosmopolitanism in Tyrannosauroidea. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2018.

Loewen, M. A. and J. I. Kirkland. 2013. The evolution and biogeographic distribution of Ankylosauria: new insights from a comprehensive phylogenetic analysis. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2013:163-164.

Loewen, M. A., J. J. W. Sertich, and R. B. Irmis. 2012. The early evolution of tyrannosauroid dinosaurs: new anatomical, phylogenetic and biogeographic evidence. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2012:129.

Loewen, M. A., L. E. Zanno, R. B. Irmis, J. J. W. Sertich, and S. D. Sampson 2011. Campanian theropod evolution and intercontinental endemism on Laramidia. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2011:146.

Loewen, M. A., J. J. W. Sertich, R. B. Irmis, and S. D. Sampson 2010. Tyrannosaurid evolution and intracontinental endemism in Laramidia: new evidenece from the Campanian Wahweap Formation of Utah. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2010:123.

Loewen, M. A. 2009. Functional shifts during growth in the Late Jurassic theropod dinosaur *Allosaurus*: the implications of ontogenetic variation. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2009:136.

Loewen, M. A., S. D. Sampson, M. A. Getty, E. K. Lund, E. M. Roberts and A. L. Titus. 2009. Horned dinosaurs from the Campanian Wahweap and Kaiparowits formations, Grand Staircase-Escalante National Monument, Utah. Advances in Western Interior Late Cretaceous Paleontology and Geology, 34.

Loewen, M. A., J. J. W. Sertich, S. D. Sampson, and M. A. Getty. 2005. Unusual preservation of a new sauropodomorph from the Navajo Sandstone of Utah. Journal of Vertebrate Paleontology, 25(3):84A.

Loewen, M. A., M. A. Getty, S. D. Sampson, and J. J. W. Sertich. 2005. Collapse preservation of a prosauropod from the Jurassic Kayenta Formation of Utah. Abstract Volume of the Tracking Dinosaur Origins: the Triassic/Jurassic Terrestrial Transition Conference, St. George, Utah, p. 14.

Loewen, M. A. 2004. Variation and stratigraphic distribution of *Allosaurus* from the late Jurassic Morrison Formation, Abstracts with Programs, Geological Society of America, 36(5):524.

Loewen, M. A., S. D. Sampson, M. T. Carrano and D. J. Chure. 2003. Morphology, taxonomy and stratigraphy of *Allosaurus* from the late Jurassic Morrison Formation, Journal of Vertebrate Paleontology, 23(3):72A.

Loewen, M. A., S. A. Hynek and R. A. Cushman Jr. 2003. False indicators of a climatic shift in the Green River Formation of Fossil Basin and the importance of recognizing stream capture in regional correlations of kerogen-rich lacustrine sediments. Abstracts with Programs, Geological Society of America, 35(6):105.

Loewen, M. A. and H. P. Buchheim. 2002. Lithofacies and paleoenvironments of the Angelo Member of the Green River Formation in Fossil Basin, SW Wyoming: an under-filled Fossil Lake. Abstracts with programs, Geological Society of America 34(6):479.

Loewen, M. A., M. T. Carrano and S. D. Sampson. 2002. Ontogenetic changes in hindlimb musculature and function in the Late Jurassic theropod *Allosaurus*. Journal of Vertebrate Paleontology, 22(3):80A.

Loewen, M. A. and S. D. Sampson, 2001, Hindlimb ontogeny in a Late Jurassic theropod dinosaur *Allosaurus* *fragilis*. Society for Integrative and Comparative Biology, Abstracts 276.

Loewen, M. A., K. E. Samonds and M. F. Ramarolahy. 2001. Lake Tsimanampetsotsa, a modern alkaline playa lake in Madagascar. Abstracts with programs, Geological Society of America, 33(6):443.

Loewen, M. A., S. D. Sampson, M. A. Getty and R. L. Difley. 2001. The upland dinosaur fauna of the Late Cretaceous (Maastrichtian) North Horn Formation. Journal of Vertebrate Paleontology, 21(3):74A.

Loewen, M. A. and S. D. Sampson. 2000. Femoral ontogeny in *Allosaurus* *fragilis* (Theropoda: Allosauroidea) from the Late Jurassic Cleveland-Lloyd Dinosaur Quarry, central Utah. Journal of Vertebrate Paleontology, 20(3):54A.

Loewen, M. A. and J. M. de Gibert. 1999. The first occurrence of Cenozoic fish trails (*Undichna*) from Eocene Fossil Lake, Wyoming. Journal of Vertebrate Paleontology, 19(3):59A.

Loewen, M. A., V. L. Leggitt, H. P. Buchheim and R. E. Biaggi. 1999. The contribution of caddisfly (Trichoptera) larvae in the formation of stromatolites and tufa from the Eocene Green River and Wasatch Formations, Wyoming. Abstracts with Programs, Lennou, the Second International Limnogeological Congress, Brest, France, May 1999, T:43 – 44.

Loewen, M. A., V. L. Leggitt, R. E. Biaggi, H. P. Buchheim and R. A. Cushman Jr. 1999. Morphologic variation in caddisfly (Trichoptera) larval cases from the Eocene Green River and Wasatch Formations, Wyoming. Abstracts with programs, Geological Society of America, 31(7):470.

Loewen, M. A. and H. P. Buchheim. 1998. Lithofacies and paleoenvironments during the culminating phases of Eocene Fossil Lake (Green River Formation). Abstracts with Programs, Geological Society of America, 30(7):334.

Loewen, M. A. and H. P. Buchheim. 1998. Paleocommunities and trophic relationships during the latter stages of Eocene Fossil Lake, SW Wyoming. Journal of Vertebrate Paleontology, 18(3):59A.

Loewen, M. A. and H. P. Buchheim. 1997. Freshwater fish in a hypersaline lake: evidences of a salinity gradient in Eocene Fossil Lake (Green River Formation). Abstracts with Programs, Geological Society of America, 29(6):43.

**Coauthored Published Abstracts**

Carpenter, S. R., M. A. Loewen, K. Chiba, E. K. Lund, and E. M. Roberts. 2019. New centrosaurine ceratopsians from the Campanian Wahweap Formation of Utah. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2019:24.

Cunningham, P. J., M. A. Loewen, and J. J. W. Sertich. 2019. The utility of periosteal aging to assess the maturity of isolated theropod cranial and femoral elements. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2019:26.

Sertich, J. J. W., M. A. Loewen and M. A. Getty. 2018. Extraordinary ceratopsid richness in the Upper Cretaceous (Campanian) Kaiparowits Formation of southern Utah highlighted by a new chasmosaurine. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2018:89.

Smith, E. A., M. A. Loewen,and E. Petersen. 2017. Manganese oxide permineralization in dinosaur bone at the uppermost Jurassic Morrison Formation unconformity. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2017:122.

Getty, M. A. and M. A. Loewen. 2016. Preparation and mounting of paleontological specimens at the Natural History Museum of Utah: an outstanding example of collaboration with museum staff, volunteers, graduate students, and external institutions. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2016:117.

Kirkland, J. I., H. L. You, L. Alcala, and M. A. Loewen. 2015. A near continuous, well-dated sequence of Creataceous Terrestrial faunas: Mid Cretaceous faunal change in the northern hemisphere as viewed from Utah. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2015:101.

Zanno, L. E., V. Arbour, T. A. Gates, P. Makovicky, M. A. Loewen, K. Button, A. Moyer, T. Bridges, and L. Herzog. 2015. Body mass transformation in the Mid-Cretaceous of North America: how estuary, range restrictions, and clade sorting shaped the evolution of dinosaur size. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2016:206.

Alicea, J. and M. A. Loewen. 2013. New *Minotaurosaurus* material from the Djodokta Formation establishes new taxonomic and stratigraphic criteria for the taxon. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2013:76.

Clayton, K. E. M. A. Loewen, and R. B. Irmis. 2013. Phylogenetic utility of hadrosaurid dinosaur (Ornithischia: Ornithopoda) integumentary impressions. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2013:107.

Kirkland, J. I., and M. A. Loewen. 2013. New nodosaurid ankylosaurs (Dinosauria) from the Lower Albian Escucha Fm., Teruel, Spain reveal that all North American and European nodosaurid species belong to separate clades since their Late Aptian origin. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2013:154-155.

Lund, E. K., P. M. O’Connor, M. A. Loewen and Z. A. Jinnah. 2012. New centrosaurine ceratopsid material from the Middle Campanian Wahweap Formation of southern Utah. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2012:131.

Wiersma, J. P., M. A. Loewen, and R. B. Irmis. 2012. A re-evaluation of *Torosaurus utahensis*: implications for Maastrichtian ceratopsian diversity in western North America. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2012:193.

Williams, M. W., R. B. Irmis, and M. A. Loewen 2012. Fish taphonomy and lake environments of the Green River Formation, Fossil Lake, Wyoming. University of Utah Undergraduate Research Opportunities Program Research Abstracts, 12:56.

Claessens, P. M. A., M. A. Loewen and Z. Lavender. 2011. A reevaluation of the genus *Ornithomimus* based on new preparation of the holotype of *O. velox* and new fossil discoveries. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2011:90.

Farke, A. A., M. A. Loewen and S. D. Sampson. 2011. The radiation of the horned dinosaurs on Laramidia. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2011:107.

Kirkland, J. I., M. A. Loewen, D. DeBlieux, S. Madsen, and J. Choiniere. 2011. New theropod cranial material from the Yellow Cat Member, Cedar Mountain Formation (Berremian-Basal Aptian, Cretaceous), Stikes Quarry, North of Arches National Park, East-Central Utah. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2010:137.

Sampson, S. D., M. A. Loewen, R. B. Irmis, J. J. W. Sertich, and D. Evans. 2011. Laurasian faunal interchange in the Late Cretaceous: the Out of Laramidia hypothesis. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2010:185.

Clayton, K. E., M. A. Loewen, A. A. Farke, and S. D. Sampson. 2010. A reevaluation of epiparietal homology within chasmosaurine ceratopsids (Ornithischia) based on newly discovered taxa. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2010:73.

Kirkland, J. I., R. Hunt-Foster, J. Foster and M. A. Loewen. 2010. Newly recovered skeletal elements of the Late Jurassic dinosaur Mymoorapelta from its type locality in the Morrison Formation permits reevaluation of anylosaur phylogeny. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2010:116.

Lavender, Z., A. Drake, M. A. Loewen, L. E. Zanno, and L. Claessens. 2010. Three-dimensional geometric morphometric analysis and univariant measurement analysis on an undescribed *Ornithomimus* manus. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2010:120.

Lund, E. K., S. D. Sampson, and M. A. Loewen. 2010. A new basal centrosaurine dinosaur (Ornithischia: Ceratopsidae) from the Upper Cretaceous of Utah: evidence of a previously unknown clade of southern centrosaurines from Laramidia. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2010:125.

Clayton, K. E., M. A. Loewen, S. D. Sampson, A. A. Farke and R. B. Irmis. 2009. Epiparietal homology within centrosaurine (Ornithischia, Ceratopsidae): a re-evaluation based on newly discovered basal taxa. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2009:80.

Getty, M. A., M. Vickaryous and M. A. Loewen. 2009. Ankylosaurid dinosaurs of the Upper Campanian Kaiparowits Formation, Grand Staircase-Escalante National Monument. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2009:104.

Sampson, S. D., M. A. Loewen, A. A. Farke, J. A. Smith and E. M. Roberts. 2009. Two new chasmosaurine ceratopsids from the Late Cretaceous (Campanian) of Utah. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2009:175.

Wiersma, J., M. A. Loewen and M. A. Getty. 2009. Taphonomy of a subadult tyrannosaur from the Upper Campanian Kaiparowits Formation of Utah. Journal of Vertebrate Paleontology, SVP Program and Abstracts Book, 2009:201.

Getty, M. A., M. A. Loewen, E. M. Roberts and A. L. Titus. 2009. Taphonomy of associated dinosaur remains from the Kaiparowits Formation, Grand Staircase-Escalante National Monument, Utah. Advances in Western Interior Late Cretaceous Paleontology and Geology, 22.

Sampson, S. D., E. M. Roberts, M. A. Loewen, M. A. Getty, T. A. Gates, L. E. Zanno and A. L. Titus. 2009. Dinosaurs and other macrovertebrates from the Upper Cretaceous (Campanian) deposits of Grand Staircase-Escalante National Monument, Utah. Advances in Western Interior Late Cretaceous Paleontology and Geology, 42.

Zanno, L. E., M. A. Loewen, L. Claessens and S. D. Sampson. 2009. Late Cretaceous theropod dinosaurs of southern Utah: progress and perspectives. Advances in Western Interior Late Cretaceous Paleontology and Geology, 50.

Brandau, D., M. A. Loewen, A. A. Farke and B. J. Baziak. 2008. Cranial variation in the Late Jurassic theropod dinosaur *Allosaurus*. Journal of Vertebrate Paleontology, 28(3):55A.

Lund, E. K., M. A. Loewen, M. A. Getty, S. D. Sampson and E. M. Roberts. 2008. Preservation of dinosaur integumentary impressions in the Upper Cretaceous Kaiparowits Formation, Grand Staircase-Escalante National Monument, southern Utah. Journal of Vertebrate Paleontology, 28(3):108A.

Neabore, S., M. A. Loewen, L. E. Zanno, and L. Claessens. 2007. Three-dimensional scanning and analysis of the first diagnostic ornithomimid forelimb material from the Late Cretaceous Kaiparowits Formation. Journal of Vertebrate Paleontology, 27(3):123A.

Sertich, J. J. W., F. K. Manthi, S. D. Sampson, M. A. Loewen and M. A. Getty. 2006. Rift Valley dinosaurs: a new Late Cretaceous vertebrate fauna from Kenya. Journal of Vertebrate Paleontology, 26(3):124A.

Getty, M. A., M. A. Loewen and E. M. Roberts. 2006. Collection and use of taphonomic data from vertebrate localities: lessons from six years of paleontological inventory and excavation in Grand Staircase-Escalante National Monument, Utah. Journal of Vertebrate Paleontology, 26(3):67A.

Sertich, J. J. W., S. D. Sampson, M. A. Loewen, P. Gathogo, F. H. Brown, F. K. Manthi. 2005. Dinosaurs of Kenya’s rift: fossil preservation in the Lubur Sandstone of northern Kenya. Journal of Vertebrate Paleontology, 25(3):114A.

Baziak, B. J. and M. A. Loewen, 2004, Intraspecific variation and ontogeny in cranial elements of *Allosaurus* *fragilis* from the Late Jurassic Cleveland-Lloyd Dinosaur Quarry of central Utah. Journal of Vertebrate Paleontology, 24(3):37A.

Carrano, M. T., S. D. Sampson and M. A. Loewen. 2004. New discoveries of *Masiakasaurus knopfleri* and the morphology of the Noasauridae (Dinosauria: Theropoda). Journal of Vertebrate Paleontology, 24(3):44A.

Leggitt, V. L., R. A. Cushman Jr. and M. A. Loewen. 2004. Caddisfly (Insecta: Trichoptera) pupal cases used as unique autochthonous paleoenvironmental indicators: Eocene Lake Gosiute. Geological Society of America, 36(5):65.

Sampson, S. D., M. A. Loewen, E. M. Roberts, J. A. Smith, L. E. Zanno and T. A. Gates. 2004. Provincialism in Late Cretaceous terrestrial faunas: new evidence from the Campanian Kaiparowits Formation of Utah. Journal of Vertebrate Paleontology, 24(3):108A.

Smith, J. A., S. D. Sampson, E. M. Roberts, M. A. Getty and M. A. Loewen. 2004. A new chasmosaurine ceratopsian from the Upper Cretaceous Kaiparowits Formation, Grand Staircase-Escalante National Monument, Utah. Journal of Vertebrate Paleontology, 24(3):114A.

Getty, M. A., E. M. Roberts, M. A. Loewen, J. A. Smith, T. A. Gates and S. D. Sampson. 2003. Taphonomy of a chasmosaurine ceratopsian skeleton from the Campanian Kaiparowits Formation, Grand Staircase-Escalante National Monument, Utah. Journal of Vertebrate Paleontology, 23(3):54-55A.

Pinegar, R. T., M. A. Loewen, K. C. Cloward, R. J. Hunter and C. J. Weege. 2003. A juvenile allosaur with preserved integument from the basal Morrison Formation of central Wyoming. Journal of Vertebrate Paleontology, 23(3):87-88A.

Sampson, S. D., M. A. Loewen, J. O. Farlow and M. T. Carrano. 2003. Ecology and evolution of gigantism in predatory dinosaurs. Journal of Vertebrate Paleontology, 23(3):92A.

Buchheim H. P., M. A. Loewen, R. A. Cushman Jr. and R. E. Biaggi. 2002. Stratigraphic revision of the Green River Formation in Fossil Basin, Wyoming: three distinct phases of Fossil Lake, Abstracts with Programs. Geological Society of America, 34(6):479.

Getty, M. A., M. A. Loewen, S. D. Sampson, T. A. Gates and A. L. Titus. 2002. Paleontological fieldwork in and around Utah’s Grand Staircase-Escalante National Monument: logistical and environmental issues. Abstracts with Programs, Geological Society of America, 34(6):237.

Getty, M. A., S. D. Sampson, M. A. Loewen and A. L. Titus. 2002. Logistical and environmental issues surrounding paleontological fieldwork in Grand Staircase-Escalante National Monument, Southern Utah. Journal of Vertebrate Paleontology, 22(3):58A.

Getty, M. A., S. D. Sampson, M. A. Loewen and T. A. Gates. 2002. Logistical issues surrounding paleontological fieldwork in Grand Staircase-Escalante National Monument, Southern Utah. Abstracts with Programs, Rocky Mountain Section, Geological Society of America.

Sampson, S. D., M. A. Loewen, T. A. Gates, L. E. Zanno and J. I. Kirkland. 2002. New evidence of dinosaurs and other vertebrates from the Upper Cretaceous Wahweap and Kaiparowits formations, Grand Staircase-Escalante National Monument, Southern Utah. Abstracts with Programs, Rocky Mountain Section, Geological Society of America.

Smith, J. A., S. D. Sampson, M. A. Loewen and V. L. Santucci. 2002. Trackway evidence of possible gregarious behavior in large theropods from the Early Jurassic Moenave Formation of Zion National Park. Journal of Vertebrate Paleontology, 22(3):108A.

### Buchheim, H. P. and M. A. Loewen. 2001. The climate of Eocene Fossil Lake (Green River Formation, Wyoming) as determined from vertical and lateral facies trends. AAPG Pacific Section abstracts, AAPG Bulletin, 85:6 p.1116.

### Samonds, K. E., M. A. Loewen, G. A. Buckley and R. L. Whatley. 2001. Terrestrial Vertebrate Fossils from the Cenozoic of Madagascar. Abstracts with programs, Geological Society of America, 33(6):388.

Leggitt, V. L. and M. A. Loewen. 2000. A dense concentration of crocodilian eggshell fragments: Eocene DeBeque Formation, northwestern Colorado. Journal of Vertebrate Paleontology, 20(3):53-54A.

Leggitt, V. L., H. P. Buchheim and M. A. Loewen. 1999. First report of a fully articulated *Presbyornis* (Aves: Anseriformes) wing from a Colorado *Presbyornis* nesting site. Journal of Vertebrate Paleontology, 19(3):59A.

Buchheim, H. P. and M. A. Loewen. 1999. Lateral and vertical salinity variation in Eocene Fossil Lake, Green River Formation, Wyoming. Abstracts with Programs, Lennou, the Second International Limnogeological Congress, Brest, France, May 1999, T:22-23.

Leggitt, V. L., M. A. Loewen, H. P. Buchheim and R. E. Biaggi. 1999. A reinterpretation of “*Oocardium* tufa” from the Eocene Green River Formation of Wyoming. Abstracts with Programs, Lennou, the Second International Limnogeological Congress, Brest, France, May 1999, P:30 – 31.