

2014 GSA Presidential Address

GSA TODAY

A PUBLICATION OF THE GEOLOGICAL SOCIETY OF AMERICA®

Mapping the Planets— Geology Stakes Its Claim



Diversity in all its forms: IPC4 as an invaluable opportunity for STEPPE grant recipients

Javier Luque, Dept. of Biological Sciences, University of Alberta/Smithsonian Tropical Research Institute, Edmonton, Alberta, Canada, luque@ualberta.ca; **Heda Agic**, Dept. of Earth Sciences, Uppsala University, Uppsala, Sweden, heda.agic@geo.uu.se; **Evan P. Anderson**, Dept. of Geological Sciences, University of Colorado, Boulder, Colorado, USA, evan.p.anderson@colorado.edu; **Robyn Dahl**, Dept. of Earth Sciences, University of California, Riverside, California, USA, robymdahl@gmail.com; **Mike Donovan**, Dept. of Geosciences, Penn State University, State College, Pennsylvania, USA, mpd187@psu.edu; **Daniel J. Field**, Dept. of Geology & Geophysics, Yale University, New Haven, Connecticut, USA, daniel.field@yale.edu; **John A. Fronimos**, Dept. of Earth and Environmental Sciences/Museum of Paleontology, University of Michigan, Ann Arbor, Michigan, USA, jfronimo@umich.edu; **Montana Hodges**, University of Montana Paleontology Center, Missoula, Montana, USA, montana.hodges@umconnect.umd.edu; **Gary J. Motz**, Center for Biological Research Collections, Indiana University, Bloomington, Indiana, USA, garymotz@indiana.edu; **Ryan Roney**, Dept. of Earth and Planetary Sciences, University of Tennessee, Knoxville, Tennessee, USA, rroney1@utk.edu; **Erin E. Saupe**, Dept. of Geology & Geophysics, Yale University, New Haven, Connecticut, USA, erin.saupe@yale.edu; **Sarah Sheffield**, Dept. of Earth and Planetary Sciences, University of Tennessee, Knoxville, Tennessee, USA, sarahsheffield89@gmail.com; **Lydia Tackett**, Dept. of Geosciences, North Dakota State University, Fargo, North Dakota, USA, lydia.tackett@gmail.com; **Jessica N. Tashman**, Dept. of Geology, Kent State University, Kent, Ohio, USA, jtashman@kent.edu; and **Zuzanna Wawrzyniak**, Dept. of Palaeontology and Stratigraphy, University of Silesia, Katowice, Poland, zuza.wawrzyniak@gmail.com

Earth's biological diversity comprises ~1.7 million extant species known to science, and there are many millions yet to be discovered (Gewin, 2002; Mora et al., 2011). Today's biodiversity, however, is thought to represent only ~1% of the life that has ever existed on our planet. Moreover, much of this life is currently in peril from what has been called the "6th great extinction event," largely precipitated by the overwhelming influence humans have had on the biosphere (Brook et al., 2008). If modern biodiversity represents only a small fraction of the flora and fauna that once lived, what can we learn from past diversity to understand the future of modern biota? What processes acted to shape our current diversity? How do living species relate to other branches on the tree of life?

Paleontology, from the Greek *palaaios* (old, ancient), *ontos* (being, creature), and *logos* (thought, study), involves the study of

life through geological time. The fossil record provides a historical ledger that sheds light on the origins of today's biodiversity and how organisms relate to each other via ancestor-descendant relationships. Over the last several years, new paleontological discoveries and technologic developments have allowed for more efficient and innovative ways to analyze the fossil record. This, in turn, has improved our understanding of how life on Earth has waxed and waned through time.

The vigor and relevance of contemporary paleontological research were on full display at the 4th International Palaeontological Congress (IPC4) in the city of Mendoza, Argentina (28 Sept. to 3 Oct. 2014), where nearly 1,000 paleontologists from around the world converged to celebrate paleontology. The research presented at IPC4—the largest International Palaeontological Congress to date—was highly diverse in its topical, organismal, geographical, and temporal coverage. The workshops, symposia, short courses, and field trips were similarly varied, as were the conference attendees, who hailed from 50 different countries and represented many different stages of their paleontological careers, from students to emeritus professors. In short, diversity in all its forms was the very heart of IPC4.

We write this article as the fortunate recipients of 15 travel grants offered by STEPPE, an NSF-supported consortium whose purpose is to promote multidisciplinary research and education on Earth's deep-time sedimentary crust (see <http://steppe.org/>). The funding opportunities provided by STEPPE, in collaboration with The Geological Society of America, the Paleobotanical Section of the Botanical Society of America, the Paleontological Society, the Society for Sedimentary Geology, and the Society for Vertebrate Paleontology, helped to alleviate a substantial financial burden for many students. For many of us, IPC4 provided our first opportunity to visit Argentina, South America, or even the Southern Hemisphere, and without STEPPE's aid, we would not have experienced the new research and diverse perspectives the conference offered, including following in the footsteps of Charles Darwin's travels in the Andes on the many conference field trips. The student funding offered by the STEPPE consortium and collaborative professional societies has greatly assisted all of us in our nascent careers, and in this instance provided an incredibly motivating, reassuring, and intellectually stimulating experience that benefitted all of our futures in paleontology.

As STEPPE awardees, we are as diverse as the conference proceedings. We study taxa as disparate as tetrapods, plants, arthropods, and early eukaryotes, and research topics from paleoecology, paleobiogeography, and biomechanics, to exceptional preservations, functional morphology, visual systems, and

predator-prey interactions (IPC4, 2014; STEPPE, 2014). The temporal range of our research also spans from the very old (Proterozoic) to the very young (Neogene to recent). We had the opportunity to showcase our research to world experts via poster and oral presentations, generate novel research ideas that cut across disciplines, make useful contacts for future research questions, and learn of research similar to ours from around the globe. These interactions, both amongst the STEPPE awardees and our fellow paleontologists, will hopefully lay the groundwork for new discoveries, technological advances, and paradigm shifts that will unfold over the coming decades. It is interesting to note that although the overwhelming majority of the STEPPE grant recipients are student members of the five partner institutions already mentioned, many of us had never met before IPC4. Thus, in addition to the benefits of meeting established experts in our fields, we had a unique opportunity to form new, lasting research collaborative relationships with other early career scientists. This goes to show that it is through collaborative networks such as the STEPPE consortium, among many others, that the inherently multidisciplinary areas of our study can truly come together in a way they could not as individual entities.

It is an incredibly exciting time to be a young paleontologist. Owing to the accessible nature of research in our discipline, paleontology enjoys wide media coverage and enthusiastic contributions from amateurs. Further, the advent of exciting new analytical methods, combined with seemingly endless fossil

discoveries, is shedding new light on the history of life and the evolution of our planet. As the field of paleontology continues to enjoy a renaissance, the role of young, motivated researchers will be invaluable. As junior researchers on the cusp of careers in this discipline, we believe that the opportunity for early career scientists to attend these kinds of meetings, facilitated by granting agencies and institutions such as the STEPPE consortium, is pivotal to achieve our goals of becoming future leaders in the field, and contribute to our ever-improving knowledge of the origin of Earth's overwhelming diversity through deep time.

REFERENCES CITED

- Brook, B.W., Sodhi, N.S., and Bradshaw, C.J.A., 2008, Synergies among extinction drivers under global change: *Trends in Ecology & Evolution*, v. 23, no. 8, p. 453–460, doi: 10.1016/j.tree.2008.03.011.
- Gewin, V., 2002, Taxonomy: All living things, online: *Nature*, v. 418, p. 362–363, doi: 10.1038/418362a.
- IPC4, 2014, 4th International Palaeontological Conference: A history of life: A view from the southern hemisphere, abstract volume, 936 p., <http://www.ipc4mendoza2014.org.ar/wp-content/uploads/2014/10/Abstract-Volume-IPC4.pdf> (last accessed 14 Nov. 2014).
- Mora, C., Tittensor, D.P., Adl, S., Simpson, A.G.B., and Worm, B., 2011, How many species are there on Earth and in the Ocean?: *PLoS Biology*, v. 9, no. 8, p. e1001127, doi: 10.1371/journal.pbio.1001127.
- STEPPE, 2014, IPC4 blogs: <http://steppe.org/category/steppe-blogs/> (last accessed 14 Nov. 2014).



STEPPE travel awardees. From left to right, top row: Evan P. Anderson, Heda Agic, Ryan Roney, Javier Luque, Robyn Dahl, Gary J. Motz, Daniel J. Field; bottom row: Jessica N. Tashman, Zuzanna Wawrzyniak, Lydia Tackett, Mike Donovan, John A. Fronimos, Montana Hodges, and Sarah Sheffield (not pictured: Erin E. Saupe).