SVP 2010 Education and Outreach Poster Session: Titles and Authors

Novel Approaches to Informal Educational Outreach

Organizers: Larisa R. G. DeSantis, Stuart Sumida, and Robin Whatley

Location: David L. Lawrence Convention Center, 3rd Floor, Foyer/Registration Area

Dates: Sunday, October 10 through Wednesday, October 13

AUTHORS WILL BE PRESENT AT THEIR POSTERS: Sunday, October 10, 4:15-5:15pm

APPLICATIONS OF THE GEOWALL IN VERTEBRATE PALEONTOLOGY

Russell W. Graham, Chuck A. Anderson, and Julianne Snider

The GeoWall is a stereoscopic projection system using off-the-shelf hardware and software. At its core, the GeoWall is a desktop computer and a pair of data projectors with polarizing filters in front of them. The software displays, or generates, left and right eye stereo-images of a variety of data types and with the aid of polarizing glasses, the images provide a three-dimensional view. The non-specialized nature of the technology keeps initial system purchase and maintenance costs low. Displayed content types include stereo pair imagery, stereo video and fully interactive three-dimensional models and data visualizations. Content subject areas include, but are not limited to, earth science, chemistry, astronomy, meteorology, engineering, and computer art. This versatility makes the GeoWall especially useful for vertebrate paleontologists in research, classes, public presentations and interactive museum exhibits. Paleontological content is unlimited but typical images include atomic scale views of molecular structures, virtual views of individual bones, complete specimens, and CT tomography, 3D site maps and bone beds, reconstructions of animals and digital field trips. Chuck Anderson has developed a visitor-driven user interface for the EMS museum GeoWall that allows for textual explanations of topics as well as menu-driven programs. This development enhances the educational capacity of the GeoWall and can make it a stand-alone exhibit, typically they are human facilitated. GeoWalls can also be mobile so that they can be taken into the classroom or outside of the hosting facility. A GeoWall Consortium facilitates sharing of software, images and programs as well as on-line help.

HUMAN EVOLUTION AT THE SMITHSONIAN: NEW APPROACHES TO PUBLIC ENGAGEMENT

Briana Pobiner and Bill Watson

In conjunction with the opening of the David H. Koch Hall of Human Origins, the Department of Anthropology and Office of Education and Outreach at the Smithsonian's National Museum of Natural History have partnered to design and evaluate an innovative menu of products and programming to engage onsite and online visitors. These include regularly scheduled in-hall events (Scientist is In, HOT Topics discussions); themed maps with discussion-provoking questions; a well-trained volunteer corps who deliver additional exhibition interactivity at Discover Stations; an early human skull exploration activity in our Discovery Room, geared towards younger visitors; an interactive website; Scientist is Online events; and social media (facebook and twitter). Results of an evaluation that focused on visitors' engagement with ideas and the influence of our efforts on their understanding of and interest in this important topic are presented here.

"THE ONE THAT GOT AWAY" (50 MILLION YEARS AGO): EDUCATIONAL OUTREACH ASSOCIATED WITH A FISH TRACE FOSSIL FROM THE GREEN RIVER FORMATION (EOCENE), WYOMING

Anthony J. Martin, Gonzalo M. Vazquez-Prokopec, and Michael Page

In our study of a fish trace fossil from the Green River Formation (Eocene) of Wyoming, we attempted to interpret and explain it in a way that was accessible to both professional colleagues and the general public. The trace fossil, identified as *Undichna* cf. *U. simplicitas*, was recovered and donated by professional fossil collectors to Fossil Butte National Monument; hence it became property of the U.S. National Park Service and was assigned a specimen number (FOBU-12718). We interpreted the trace fossil as the first known combined feeding and swimming trace made by the bottom-dwelling fish *Notogoneus osculus* Cope, a teleost known from the Green River Formation since the 1880s. We applied spatial analyses and Fourier-transform methods to better quantify the trace fossil, and through these techniques estimated the fish was 45 cm long. Although these methods were relatively complex, we were committed to making sure our results could be communicated in an understandable and stimulating way for paleontologists and the public. Moreover, we wanted to ensure open access to our results and especially to the trace fossil, which we also thought was a visually compelling specimen. Thus we followed a threefold approach: (1) we submitted our research results for peer review in a public-access journal (*PLoS One*) that had a demonstrated history of public outreach in paleontology; (2) we placed a high-resolution digital image of the trace fossil FOBU-12718 onto a publicly accessible Web site, and used Deep Zoom™ software so anyone with Internet access could interactively view the trace fossil in extreme detail through an interactive pan-and-zoom interface; and (3) we prepared a press release with our university media-relations office that related the research in an engaging manner so it would gain the interest of non-specialists. With regard to the last of these three steps, we incorporated the theme of "the one that got away," a cliché associated with recreational fishing that lent well to an easy connection with the public. This hook was combined with our ability to state the exact size of the fish, but also included the "detective-story" angle of a paleontological mystery that had not been solved since the 1880s. Thus, despite the potentially esoteric topic of the research – an Eocene fish trace fossil – we felt that our goal of reaching a broad audience was successfully fulfilled, while also increasing professional access to a potentially significant paleontological discovery.

FACEBOOK AS A PUBLIC OUTREACH TOOL FOR SMALL MUSEUMS AND RESEARCH LABS

Andrew A. Farke and Lawrence M. Witmer

Institutional websites are widely utilized for public outreach, particularly for "virtual exhibits" and other information aimed at the general public. However, most websites have several disadvantages, including: 1) an extensive time and monetary commitment is required to develop, host and update content; 2) the target audience receives updates only when they purposefully visit the site; and 3) only one-way communication is allowed. Popular social networking sites, such as Facebook, bypass these issues and offer a rich virtual outreach platform at no cost. For the past year, the Raymond M. Alf Museum of Paleontology (a comparatively small institution) and WitmerLab (a small research group based at Ohio University in Athens) have utilized Facebook as an important part of their outreach efforts. Members of Facebook who subscribe to content feeds automatically receive updates, which can include text, photos, or video. Typical content includes real-time news from field sites and behind-the-scenes information on research results or in-progress projects. Users are able to comment upon these postings, share them with friends, and even post their own content, giving users a real sense of active participation. Although the emphasis of these content feeds is upon short text blurbs or individual images, posts can direct interested individuals to the more formal institutional website for additional information. Facebook also provides extensive usage and demographic statistics, which can be helpful for further tailoring of the content for the audience. In practical terms, minimal time commitment (typically just a few minutes per day, at most) is needed to update a Facebook page once it has been established. Updates on fieldwork or collections activity, as well as images of unusual specimens, are particularly popular with a broad cross-section of users. In addition to allowing a frequently updated and interactive experience, as well as driving visits to institutional websites, Facebook and other social networking outlets allow a more immediate and intimate view into the scientific process in the field, at the lab, and in the museum.

PROMOTING A CULTURE OF OUTREACH WITHIN AN ACTIVE UNIVERSITY RESEARCH LAB SETTING: WITMERLAB AT OHIO UNIVERSITY

Amy R. Martiny, Ryan C. Ridgely, David L. Dufeau, William R. Porter, Jason M. Bourke, Ashley C. Morhardt, Eric D. Snively, and Lawrence M. Witmer

The main mission of university research labs is primary research. NSF added another line to the mission statement in the mid-1990s with their review criterion mandating Broader Impacts. Research labs have often struggled with this requirement, as well as the general notion of outreach. WitmerLab at Ohio University (OU) has embraced outreach—and not just to satisfy NSF, but because paleobiology truly can reach out beyond a narrow community of scientists to engage the public about science and evolution. Given politico-cultural threats to science, outreach isn't just the right thing to do, it's self-preservation. WitmerLab's strategic plan to dovetail primary research and outreach involves the web, broadcast media, and in-person engagements. OU websites host a wealth of resources including photo galleries of the skull cast collection, 3D visualization

pages with movies and 3D PDFs, lab news, personnel, facilities, and, most significantly, Project Pages on individual research projects, providing not only PDF downloads of the primary publication, CT data, images, and movies, but also common-language summaries and links to news features. In the spirit of "being where people are," WitmerLab has a Facebook page that provides a more intimate, behind-the-scenes perspective and direct interaction with people around the globe, and a YouTube channel with >100 videos that provides another outlet for direct interaction. These social media posts all direct users back to the primary research on the OU sites. WitmerLab has also become a common location shoot for documentaries on major cable networks, allowing lab research to be seen in HD by millions of viewers worldwide. Finally, WitmerLab members have been involved with a diversity of public programs, ranging from lab tours and workshops to public lectures around the US. Although Witmer is typically the "mouthpiece," all lab members are participants, and thus receive training in not only outreach but also in balancing and integrating outreach and research. The goal is not just to engage the public, but also to bring the public "into the lab" to share the scientific foundations, methods—and excitement—of primary research.

SCIENCE PODCASTING AS A MEANS OF DISSEMINATING CURRENT PEER-REVIEWED WORK TO THE LAY PUBLIC

Ryan Haupt, Patrick Wheatley, and Charles Barnhart

Podcasting (posting media files online for free download) allows a small group to reach large audiences with little effort and funds in a new and effective way. Presented and delivered exclusively online, podcasting permits quick turnaround time from publication of new research to the presentation of those findings to the public, about a week or less. With modern connectivity, interviewing primary researchers and experts is simple. Therefore information often stems from the source. Science podcasting has deficiencies. Apple's iTunes, and other aggregators, are full of pseudo-scientific shows that chose to put themselves into scientific categories. True science shows, sponsored by larger agencies or those produced by scientifically-literate laypeople, often lack the expertise of working scientists. *Science… sort of*, made by three graduate students from varying fields is unique for this reason. As knowledgeable podcasters we can interview primary investigators, read peer-reviewed literature, not press releases, and relay the excitement of scientific discovery to our audience. The only goal is to provide pro-science content in a way that is entertaining to as wide an audience as possible. To that end, the show is downloaded weekly in all six populated continents. People from working class backgrounds are often influenced by pop-culture when choosing a career in academia. *Science… sort of* could inspire anyone with internet access. It's free, which breaks down economic barriers could stunt someone's interest. Our accessibility as hosts opens the gates to academia's ivory tower: listeners communicate with us directly, which we encourage and readily engage in. This set of distinct advantages to podcasting as a means of scientific outreach and more specifically in regards to the show *Science… sort of*, demonstrates podcasting's potential. It inspires, informs and connects people to scientific research and the people conducting it, in a meaningful and positive way that few other media outlets do. Its potential for cost-effective and limitless growth should serve as an example for how scientists can interact with a large segment of the public and excite them about science.

BRINGING CURRENT PALEONTOLOGICAL RESEARCH TO K-12+ CLASSROOMS THROUGH INQUIRY-BASED MODULES

Larisa R. G. DeSantis

The discipline of paleontology is captivating and dynamic, with current research contributing to the development of new ideas, hypotheses, and research questions every day. However, the excitement for paleontological discovery is not always felt by K-12+ students – particularly secondary school students. This is potentially due to the lack of communication between current science and that taught in the classroom. By increasing the communication of scientific methods and results of on-going scientific discoveries, K-12+ students can become more scientifically literate through inquiry-based activities developed from current research. Here, I demonstrate how current paleontological and paleoecological research can be translated into educational activities that mimic the actual research processes conducted by paleontologists. Through case examples of paleontological modules, I demonstrate how inquiry-based activities are developed that communicate "hot off the presses" science relating to reconstructing past environmental change during the Cenozoic (using morphology and dental microwear tools), inferring the frequency of hurricanes in the past (using stable isotope data), and assessing the paleobiology and paleoecology of Megalodon (using diverse methods ranging from cladistics to growth increment analysis). Additionally, I discuss an evolution module that strategically teaches absolute and relative dating, cladistics, and natural selection, avoiding the "e-word" until a culminating discussion. These modules were developed as part of National Science Foundation GK-12 programs and/or as broader-impact activities associated with current research. Through publication in peer-reviewed, teacher read journals (e.g., low cost science teacher association publications) and on-line dissemination, these modules have effectively engaged K-12+ students through inquiry-based lessons designed to address multiple learning styles and provide opportunities for individual and collaborative scientific discovery. As *there is no better high than discovery* (E.O.Wilson), we must strive to bring the research that fascinates us to future generations of scientists and citizens.

GE70: A UNIQUE METHOD FOR TEACHING EVOLUTIONARY CONCEPTS TO NON-SCIENCE MAJORS

Anthony R. Friscia

The only exposure many humanities and social sciences undergraduate majors get to the 'hard' sciences is through their 'general education' (GE) coursework. Often this involves taking a number of disjointed classes chosen 'a la carte', with no central theme linking them. A better approach would be to have students take a sequence of courses, allowing for themes to be followed and continuity across topics. As part of a campus-wide revision of the GE curriculum, the University of California – Los Angeles (UCLA), initiated the Freshman Cluster program to address this issue across. The only pure science course in the Freshman Cluster program is GE70: Evolution of the Cosmos and Life. This multi-disciplinary course includes faculty from all over campus: astronomy & physics, earth & space sciences, biology, anthropology, psychology and history of science, and allows for the dissemination of the most current research in their respective fields at a level that non-majors will understand. The course covers everything from the Big Bang to the evolution of humans through a series of 3 courses offered over a year, and enrolls only freshmen students. The first two quarters are traditional lecture/lab style courses, with the culmination of the class being the spring seminars, where every student takes a seminar taught by a member of the teaching team. Students have the same instructors and classmates throughout the year, building a community that they can rely on during their transition to college life. Follow-up studies have shown that the course had a uniquely positive effect on the students, and many cited it as the highlight of their undergraduate careers.

USING MUSEUM RESOURCES FOR AUTHENTIC RESEARCH TO INCREASE ENGAGEMENT IN SCIENCE IN AN URBAN HIGH SCHOOL

Beth E. Mowry and William R. Wahl

A high school Earth Science teacher and the Preparation Lab Manager/Researcher at Bighorn Basin Foundation/Wyoming Dinosaur Center (BHBF/WDC) collaborated to provide an authentic research experience for inner-city high school students The teacher attended a one-week Teacher's Program and an additional week at the BHBF/WDC in Thermopolis, Wyoming to learn the basics of fossil collection and preparation. The Big Horn Basin Foundation loaned raw fossil material for use in the high school classroom. The school was recently granted a waiver from the standardized state graduation exams and, instead, students are required to write a Performance-Based Assessment Task (PBAT). The students must complete independent science research, write about their findings and present their findings to a panel of adults, who will act as evaluators of their work. An upper-level science course was designed focusing on paleontology, and allowing students to complete independent research based on the fossil specimens on loan from BHBF/WDC. Course topics include in-depth study of sedimentology principles, depositional environments and fossil formation. Students were then taught how to clean and prepare the fossil specimens. Students collected matrix samples and inferred, based on grain size and compositional analysis, the depositional environment of the original organism. Through the course, the Preparation Lab Manager at BHBF/WDC provided expertise in the areas of fossil preparation, recommended resources, answered questions and mentored the teacher. A survey of course participants was conducted to measure outcomes of the collaboration. Preliminary results indicate students enrolled in the paleontology course report that the opportunity to work on authentic fossil specimens led to increased engagement, an increased interest in science as a college area of study and potentially as a career. Future studies will compare these students' level of engagement with students in other upper-level courses leading to the completion of the science PBAT at the same high school.

DEVELOPING A PALEONTOLOGY OUTREACH CURRICULUM FOR PRESCHOOL AND KINDERGARTEN CHILDREN AT THE UNIVERSITY OF NORTH DAKOTA

Karew K. Schumaker, Matthew W. Weiler, and Megan Wheeler

Paleontology outreach activities which involve preschool and kindergarten children require special considerations regarding their education level, attention span, and learning style. Many outreach activities for older children can be modified to suit preschool and kindergarten groups or new activities can be developed. Small museums can offer young children a unique opportunity to view fossil displays and provide hands-on activities. At the University of North Dakota, museum tours and hands-on activities promote learning

by focusing on a few key points and relating the fossils on display to experiences in children's lives. Key ideas presented include deep time, uniformitarianism, and what fossils indicate about past environments. Museum displays are also used to increase awareness of basic concepts such as seasons, local geography, and habitats of modern animals. Activities involving comparisons of modern and fossil animals provide an initial exposure to the idea of evolution. Hands-on activities have involved making plaster casts of fossils for the children to keep. Molding and casting activities allow for discussion regarding the scientific study of fossils and the rare, fragile nature of fossils. A field equipment activity allows children to distinguish between proper and improper equipment such as hiking boots versus sandals. This activity leads to a discussion of fossil prospecting, looking in correct stratigraphic units, leaving fossils in situ and notifying a person trained in geology or paleontology. Any activity which allows the children to touch fossils is exciting for them. Different types of fossils such as leaves, trackways, invertebrate and vertebrate fossils demonstrate the variety of life, as well as emphasize similarities between life forms. Showing a fossil bone and then having children locate that bone on their body gives them a greater understanding of the makeup of their own bodies. The development of field trip guidelines for the teachers to use in the classroom prior to and following a tour will help emphasize new terminology and ideas in hopes of fostering a better understanding.

WOLF TO WOOF: EXPLAINING HOW AND WHY SPECIES CHANGE OVER TIME

Susan J. Crockford

How do you transform a pre-teen passion for dinosaurs into a high school student's basic understanding of evolution? The topic of my 2004 Ph.D. dissertation provided me with a unique approach to this problem. I developed a testable hypothesis to explain how wolves transformed into dogs without deliberate human intervention, which applies equally to other vertebrate species. The concept pulls together all we have learned about the interaction of genes, hormones and development in generating new body forms. I have presented the model to high school biology students, university Anthropology majors (credit courses) and adult audiences (e.g. Darwin Day lectures). I have found that the approach works phenomenally well. I suggest it works because it offers at least six components that others may not, including: Accessibility - Dogs are an animal virtually everyone knows well, whether they live in the city or the country. Most people are acquainted with the range of variation in dogs and have some experience with dog behavior. Engagement - Many people are fond of dogs and their personal experiences with dogs helps hold their interest. There is also good potential for fun hands-on demonstration. No Religious Confrontation - By beginning with the origin of dogs rather than the origin of life, this approach handily side-steps religious confrontation. Critical Thinking - This approach demands critical thinking and my experience has been that once people get the hang of this, they quite enjoy it. Empowerment - This is a concept that people with limited science education can grasp. Once armed, it empowers them to think for themselves about new information they encounter, which generates tremendous positive feedback. Emphasis on Process - This approach stresses the importance of understanding the processes of evolution, particularly speciation. Science in Action - The concept is an active lesson in why we need testable hypotheses and demonstrates how they are used. In this poster, I present one of several lesson plans developed to assist high school and college biology teachers use this new approach to teaching evolution, where the six points above are emphasized.

CORRECTING MISCONCEPTIONS? ELEMENTARY TEACHERS IDEAS OF THIS THING CALLED…"SCIENCE"

Barbara J. Shaw

Elementary teachers are required to teach all subject areas in their classroom. With the advent of high stakes testing as mandated by the No Child Left Behind Act, teachers now must prepare their students for a battery of standardized tests in several subject areas, including: math, reading, social studies, and science. Oregon, in addition to these subjects, requires student work samples of an inquiry-based project in which students, throughout their school careers, develop more sophisticated approaches to this method. However, many graduate programs in teaching do not emphasize science, and as a result, most Pre-K through 5th grade teachers do not understand even so much as the fundamentals of science. In a 10-week course, two groups, classroom teachers and pre-service teachers, engaged in a science course highlighting inquiry designed for elementary teachers. During the first week of both classes, all students were asked to complete a survey with the following questions: What is science? What is the scientific method? What is evolution? The classroom teachers were also asked: How comfortable are you guiding your students in the inquiry process? These same questions were asked in the final week of class. Pre-service and classroom teachers' responses were compared, as well as the individual change through the class. The results are mixed; most teachers identified and corrected their misconceptions about science, however, a few students could not resolve the discrepancies between their ideas and the science presented before them.

DEVELOPING A NATIONAL VOLUNTEER NETWORK FOR VERTEBRATE PALEONTOLOGY TO ENHANCE PUBLIC ENGAGEMENT

Bruce J. MacFadden

Professional vertebrate paleontologists benefit greatly from volunteers engaged in field work, fossil preparation, specimen curation, and as museum docents. VP programs typically involve a few to hundreds of volunteers annually. From the professionals' perspective, volunteers represent a valuable labor resource for VP. From the volunteers' perspective, working alongside professionals represents an opportunity to learn about the process and science of VP.

Little information is available to coordinate and enhance VP volunteerism in the US. Compilation of such data would be immensely useful to both the VP community and volunteers, enhancing the synergy that exists between them both locally and nationally. *"VP VolNet" currently seeks institutions, organizations, programs, and others interested in a national initiative to coordinate and develop a national volunteer network.* Short term goals of this project will be to: (1) conduct a survey of VP professionals to compile data on specific volunteer programs and activities; (2) conduct front-end evaluation of the volunteers to understand knowledge base, specific interests, and needs assessment (e.g., training); and (3) develop an annotated bibliography of relevant articles describing model volunteer programs and best practices (including ethics). Intended project outcomes will include a better coordinated and more highly informed national volunteer network in VP. This initiative is consistent with existing volunteer/amateur networks in other natural history disciplines (e.g., astronomy, entomology, and ornithology). As VP VolNet develops, information and updates will be disseminated via the web, e-mail lists, and future VP meetings. Ultimately, a strategic goal of VP VolNet would be to support a distributed volunteer learning and e-training network with interactivity provided by web 2.0 and social media domains. VP VolNet will also link to other relevant VP and related paleo web sites.

This interactive poster will invite meeting attendees to add their volunteer program (with push pins) on a map and to submit additional relevant information if they are interested in VP VolNet.

I DIG ZAMBIA – USING VIRTUAL CLASSROOMS TO ENGAGE YOUTH IN SCIENCE AND GLOBAL CITIZENSHIP

Kenneth D. Angielczyk, Beth Sanzenbacher, Robin Whatley, and Audrey Aronowsky

Building on the first "I Dig Science" program (Tanzania 2008), 2009's "I Dig Zambia" (IDZ) was an intensive summer workshop where high school students from Chicago and New York City learned science, conservation, and culture directly from scientists and youth in Africa. Students used the creative and participatory 3D environment of Teen Second Life to collaborate from disparate locations. They conducted activities that mimicked those of scientists and Zambian NGO staff, such as hunting for fossils, discussing and interpreting their discoveries, encountering native flora and fauna, and learning about local cultures and politics. An international team of scientists demonstrated techniques and taught from remote areas of Zambia in real time using satellite terminals, digital video cameras, and laptop computers. The scientists demonstrated paleontological field techniques and provided daily interviews about their research on the P/T boundary extinction event, ancient climates, and vertebrate fossil discoveries. Virtual and digital experiences were supplemented by real-world activities like behind the scenes museum tours where students encountered real fossils and experienced African culture first hand. Students were evaluated by authoring daily blog posts, creating descriptive and summative artwork and projects, and building virtual museum exhibits showcasing their research. Students left IDZ with content knowledge in geography, conservation biology, paleontology, Zambian culture, and regional policy and current events. They gained experience in the scientific method, including formulating and testing hypotheses. Most importantly, they developed an appreciation for the real work of scientists through their participation in IDZ, which made science engaging and interactive. The "I Dig Science" program will continue in the fall of 2010 as "I Dig Brazil" (IDB). IDB will be a semester-long after school program for American teens in which they collaborate with university-level Brazilian education students and a multi-national team of experts to learn about paleontology, conservation, climate change, evolution, extinction, and economic inequality.

NEW FIELD COURSE EXPOSES MONTANA TEACHERS TO PALEONTOLOGY IN THEIR BACKYARDS

Lauren M. Berg and Greg P. Wilson

Rural communities are at the front lines of the evolution vs. creationism debate in the United States. Paleontologists doing research in rural areas are in a key position to equip educators in these communities with examples of evolution in their own backyard. In northeastern Montana, exposures of the Hell Creek and Tullock Formations offer an

excellent opportunity for active learning. They document a dynamic interval in geologic and evolutionary history that includes the end-Cretaceous mass extinction of non-avian dinosaurs and the Early Paleocene radiation of placental mammals, and for decades have been the epicenter of scientific research and debate.

Utilizing this outdoor classroom, we designed and implemented a 3-day field course for K-12 teachers from Garfield County and nearby areas in northeastern Montana. The goal of the course was to provide educators with an immersive hands-on experience in paleontological and geological field methods and research. Following an introduction to the ongoing research project, educators were instructed in basic paleontological and geological field methods, including collection and identification of vertebrate macro- and microfossils, and measurement and interpretation of stratigraphic sections. The second day educators joined field crews and participated in paleontological and geological research activities. The third day educators lead the research activities. Evening activities involved discussions of research design and interpretation of results. We utilized the "Understanding Evolution" website and independently created instruction materials and lesson plans for the teachers to use in their classrooms.

Teachers in the public education system are today asked to do more with less support, but when scientists work collaboratively with teachers, students benefit. By reaching out to educators we ensure that more children will be exposed to scientific research happening closer to home than the distant locations in textbooks. This field course allows us to engage the community in a lasting way while conveying the process and results of paleontological research, and imparting skills for interpreting the evidence for evolution.

THE OREGON MUSEUM OF SCIENCE AND INDUSTRY PALEONTOLOGY RESEARCH TEAM: 60 YEARS OF FIELDWORK AND CLASSROOM EDUCATION IN MACROEVOLUTION AND CLIMATE CHANGE

Meaghan Emery, David A. Levering, and Nicholas A. Famoso

The Oregon Museum of Science and Industry (OMSI) has been leading groups of students on hikes and digs through the 60 million year sequence of fossiliferous rocks in Eastern Oregon since 1951. Each summer the museum offers a Paleontology Research Team camp based out of Hancock Field Station, an outdoor science school nestled in the Clarno Unit of the John Day Fossil Beds National Monument. Working closely with the Bureau of Land Management and the National Park Service, high school students collect, identify and assist in cataloging fossil material from localities on public and private lands. Throughout the program students are shown the use of paleobotanical, paleosol and vertebrate fossil records as evidence for vertebrate macro-evolution as well as for regional and global climate change. Students also participate in classroom and field lessons on taphonomy, vertebrate anatomy, principles of ecology, sedimentology and stratigraphy. This variety of learning opportunities makes science accessible to students, engaging multiple learning styles and backgrounds. Literature review papers, posters and presentations are produced by students as a conclusion to the program, using classroom and field notes, primary literature, and the on-site library of texts. These projects build student skills in citation, public speaking, and clearly conveying scientific concepts to an audience of peers. Successful project completion earns the students elective science credit through their high schools, with the projects themselves retained as on-site resources for future students and staff. The Oregon Museum of Science and Industry Paleontology Research Team introduces students to the importance of the earth and life sciences. Through the use of comprehensive field and classroom instruction this program creates an energetic learning environment for students of all interests and aptitudes, built on over a half century of outdoor education knowledge and experience.

THE ARLINGTON ARCHOSAUR SITE OF NORTH TEXAS, A LARGE URBAN DINOSAUR DIG AS A SOURCE OF PUBLIC OUTREACH AND EDUCATION IN PALEONTOLOGY

Derek J. Main, Roger Fry, and Ronnie Colvin

The Arlington Archosaur Site (AAS) is a rare urban excavation located in the middle of one of America's largest metropolitan settings, the Dallas - Fort Worth (DFW) metroplex. The Arlington Archosaur Site occurs within the Cretaceous (Cenomanian: 95 Mya) Woodbine Formation sediments exposed in the city of Arlington, which is situated in the middle of the DFW metroplex. The AAS to date has produced the fossil remains of dinosaurs (ornithopoda), crocodiles (goniopholid), turtle and lungfish from a coastal delta plain. The close proximity of the ongoing excavation to two large cites provides a marvelous opportunity to educate the general public. The AAS consists of an all volunteer field crew that were drawn from the general public using the online networking group Facebook. An AAS Facebook group was established in which anyone from the public could join, and request a chance to attend a dig. Dig dates were listed online, volunteers could sign up and dig crews were assembled in a matter of days, in some instances over night. All visitors and volunteer diggers were given an AAS Field Trip Guide followed by a 45 minute geological & paleontological tour of the AAS, in an effort to teach the public about sedimentary environments, fossil preservation and ancient ecosystems. After the AAS tour, a quick "crash course" in field methods was given and volunteers were set to digging within 90 minutes of arrival. With this open public policy; dig crews varied in size from 40-50 volunteer diggers on average to upwards of 150-200 on rare occasions. To date, the AAS has accommodated over 800 volunteers and visitors within the last year of operation. With science education suffering in Texas schools, public outreach efforts such as the AAS offers a unique solution to presenting the general public with the science of paleontology.

WYOMING'S RED GULCH DINOSAUR TRACKSITE: PUBLIC PARTICIPATION IN THE CONSERVATION AND MANAGEMENT OF A WORLD-CLASS PALEONTOLOGICAL SITE

Brent H. Breithaupt, Elizabeth H. Southwell, Thomas L. Adams, and Neffra A. Matthews

Public lands of the Rocky Mountain West contain some of the most important vertebrate paleontological remains of North America. As these fossils are public resources, it is vital for the public to be activity involved with research projects when possible. An example of this type of partnership was the work done at the Red Gulch Dinosaur Tracksite (RGDT). Begun in 1997, this project brought together researchers, students, and volunteers from around the country to determine the paleontological significance of a previously unknown dinosaur tracksite in northern Wyoming. The RGDT contains over 1000 footprints from a population of theropod dinosaurs that walked across an ancient tidal flat 165 million years ago. This unique tracksite is located on land managed by the BLM and is readily accessible to the public. Its size and complexity presented an opportunity for assistants of all ages to practice their data gathering skills in observation, description, critical thinking, and "footprint sleuthing." A variety of both classical and state-of-the-art documentation methodologies were tested, making this one of the most intensively documented dinosaur tracksites in the world. At times, research at the site was a challenge, as the locality was open to the public. However, through a partnership with the BLM, the needs of students, public, and media were accommodated without negatively impacting scientific research, despite the often dramatically different objectives of these groups. During the formal study of the RGDT, the public was never distanced, but rather encouraged to visit and participate during the research investigations. Thus, the public can not only claim the site as one of their own national treasures, but also know that they assisted in making it one of world renown. The RGDT is a unique site not only for our understanding of a previously unknown Middle Jurassic dinosaur fauna, but also as an experiment in resource protection and public interpretation.

FACILITATING CRITICAL THINKING STRATEGIES FOR PALEONTOLOGICAL INORMATION AT JOHN DAY FOSSIL BEDS NATIONAL MONUMENT

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The paleontological and interpretive staff at John Day Fossil Beds National Monument (JODA) work hand-in-hand to make sure the public is getting the most current scientific information available. An array of internal and external methods is used to most effectively communicate our research to the public. JODA is lucky to have a wonderful resource built right into their Visitor Center that facilitates this process, a window into the paleontology preparation lab. Through this window, visitors to the park can directly observe the work being done by paleontologists. Positioned above the window is a big screen monitor that projects real-time images captured by a microscope camera; this allows up-close views of fossil preparation. In addition to being able to view current paleontological work, visitors participate in talks on this subject given by JODA's interpretive staff. Plans are in the works to train interpreters in basic fossil preparation and field techniques that will allow them to better explain paleontological processes. Joint workshops at the Hancock Field Station, a local science camp for children run by the Oregon Museum of Science and Industry, are given by the paleontology and interpretive staff. A silicone mold of a miohippus mandible is used to create resin replicas that students paint to match the original. Working both with paleontology and interpretive staff, students use critical thinking and a hands-on approach in understanding transitioning a fossil from the field to collections. Also offered to teachers, through JODA, are a number of specially led ranger programs including Horse Family Tree, Ashfall Discoveries, Museum Detectives, and Blast From The Past. Furthermore, a variety of educational materials including the Horse Fossil Study Kit, Fossil Kit, and videos are available for classroom use. For more information on these activities and materials, please visit our web site at www.nps.gov/joda and click on the "For Teachers" link.