

PENNSYLVANIAN FOOTPRINTS IN THE BLACK WARRIOR BASIN OF ALABAMA

edited by

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FOREWORD

As with all comparable deposits, coal mined from the Black Warrior Basin of Walker Co., Alabama, will be burned away in the near future, and the mining districts will remain as anonymous reclaimed grounds. But there has always been something more than coal in the Alabama deposits: in most of the mines, the excavation of the coal reveals something about the Earth's history of 310 million years ago, in the form of Coal Age fossils of plants and animals. Each carbon mine in Alabama has had major potential to be a window into the Coal Age. But such a special window has to be used, and this happened at Union Chapel Mine (UCM), a small surface mine near Jasper, Alabama, that was active during the 1990s. At UCM, a spectacular window presenting footprints of tetrapods and associated fossils was opened in the horizons above the Mary Lee coal bed, part of the Pottsville Formation in Alabama.

As a finding, this is very good and potentially interesting, but what is the value of such information? What is the value of fossil footprints, footprints of unknown animals, preserved and recorded on surfaces 310 million years old? An answer to this question might be found in the history of such discoveries, together with the development of natural science since the 19th century. Science, and life science history in particular, concerns the study of real things. Fossil footprints found in Carboniferous formations are real things. From the investigations of fossils from the Carboniferous, in North America in particular, we know that during this period, an important event happened: the early change in the evolution and diversification of a new kind of land-dwelling vertebrate. At this time, the record of skeletons is extended down to the periods of the Pennsylvanian and Mississippian, but the preservation, and much more the discovery, of a skeleton presents a rather significant taphonomic and stochastic bias. Unlike bones and skeletons, footprints and trackways are rather confusing and ambiguous things. However, in contrast to skeletons and bone fragments of dead animals, *footprints continued along trackways are authentic information of active life*. And moreover, there the record is not scattered by lucky chances. Footprints and trackways of tetrapod animals are obligate fossil phenomena on the surfaces associated with the environment of coal-producing formations. If an open-minded observer is crossing these surfaces in representative outcrops deposited under similar geological conditions, rich footprint material might be collected and documented. The proof is the discovery of tetrapod footprints by Alabama Paleontological Society member Ashley Allen in 1999 at UCM. After many scattered finds since the 19th century in North America, and the forgotten find of the 1920s in Alabama itself, Ashley Allen opened at UCM a renaissance for the discovery and scientific investigation of fossil life in the Carboniferous. UCM is the earliest and most extended fossil track site of terrestrially-adapted tetrapods currently known. Together and in continuation of the initial discovery, this is due to the exemplary and remarkable commitment of the members of the Alabama Paleontological Society, a local group of amateur fossil collectors.

This monograph presents a complex analysis of the fossil material collected from UCM. The studies reported herein contain, in some aspects, divergent results, in particular concerning the footprints of tetrapods. There are new answers besides new open questions. In forthcoming investigations, these and other questions will be pursued at the now-protected fossil site. The monograph, with its information concerning field work, documentation, and determination of fossil life, together with the geological framework also outlined, is an optimal basis for future research. The highlight of the work concerns the integration of the fossil material from UCM into the reconstruction of early tetrapod evolution, including the evolution of our very early amniote, specifically reptiliomorph, ancestors. Literally, the population of animals that excavates the coal meets, in the coal-bearing formation, the footprints of animals that might be their own ancestors of 310 million years ago.

The activity of the Alabama Paleontological Society demonstrates how exceptionally large sample sizes of fossils have been accumulated by the activity of local scientific-amateur collectors. These collectors devoted themselves to the aim of bringing to light a scientific particularity from the Earth's history of their home, Alabama. Paleontology needs such enthusiasm, care, activity, and tradition. This is the perfect way to develop scientific understanding of life from the long past Coal Age.

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March 18, 2005

PREFACE

The discovery of the Union Chapel Mine in late 1999 is a milestone in the history of Alabama paleontology. The site northwest of Birmingham is the richest source of well-preserved tetrapod trackways of Carboniferous age in the world. The original owners, the New Acton Coal Company, cooperated with the Alabama Department of Conservation and Natural Resources and other state and federal agencies to protect the find, now dedicated to an amateur collector as the Steven C. Minkin Paleozoic Footprint Site. The thousands of slabs of gray shale collected from mine spoil have opened a window onto a remarkable lost world of Alabama natural history. Trackways and other trace fossils of vertebrates, including amphibians, possible early reptiles, and fish, as well as those of invertebrates such as horseshoe crabs and insects, reveal life on an ancient estuarine tidal mud flat near a vast inland sea. Plants are also well preserved, but body fossils of animals are few. Except for a spider and a few insect wings, no body fossils of animals have been found from the track-bearing beds. Thus, their world is known to us chiefly by the vivid traces of their activities on the mud flats.

We are proud to deliver to the interested public a multiauthored monograph only six years after the discovery of this major fossil site. This volume represents an amateur-professional collaboration designed to preserve, protect, document, and research the traces of the animals that lived on the mud flat. The volume includes papers describing the discovery, salvaging, and documentation of the trackways collected largely by members of the Alabama Paleontological Society, a group of people who came together from diverse walks of life for the common purpose of studying and enjoying the evidence of past life in Alabama. These papers are followed by original and significant research by professionals on the geology, paleontology, and paleobotany of the site, with emphasis on the spectacular vertebrate trackways, but without ignoring associated fossils and stratigraphic context. Researchers were free to make their own interpretations, and each is responsible for his own work. Thus, the reader should not be surprised to find the same fossil given three names in as many articles: That's science, and it will take longer than six years to sort out!

Additional papers on the ethics of amateur fossil collecting, the role of the amateur paleontologist, the story behind the effort to preserve and protect the mine, and the significance of the discovery to Alabama paleontology are also included. The papers are augmented by an extensive atlas of plates showing additional specimens. The Society's success in preserving the mine for future research and discovery, and the members' generosity in donating specimens to Alabama and other museums, ensures significant results from the Union Chapel Mine for years to come.

Ronald J. Buta
Andrew K. Rindsberg
David C. Kopaska-Merkel

May 10, 2005

ACKNOWLEDGMENTS AND DEDICATION

The Alabama Paleontological Society (APS) would like to thank Dolores Reid, former owner of the New Acton Coal Company, for generously allowing us to collect fossils from the Union Chapel Mine. This work would not have been possible without her enthusiastic support. There is always a risk when people walk around the



Dolores Reid. Photo credit: Ashley Allen.

treacherous rock piles of a surface coal mine, and Mrs. Reid easily could have said no to collecting fossils on her land. The fact that we were allowed to collect and salvage fossils from the mine so soon after mining operations ended guaranteed that many specimens would be in good condition, having not been subjected to serious weathering over a long period. In gratitude for her support, we dedicate this volume to Mrs. Reid.

The APS is also grateful to Jerry and Pearl MacDonald, who visited Alabama in April, 2002 to see the Union Chapel Mine and its trackways firsthand. Jerry is well known for his major discovery of Permian vertebrate trackways in the Robledo Mountains of New Mexico, and is the author of *Earth's First Steps: Tracking Life*



Jerry and Pearl MacDonald. Photo credit: Ron Buta.

Before the Dinosaurs (Johnson Press, 1994), the story behind the discovery. In his book, Jerry recounts how he was influenced by the early discovery of vertebrate trackways near Carbon Hill, Alabama, first described by T. H. Aldrich and W. B. Jones in 1930. Shortly after his visit to Alabama, Jerry wrote a long letter to Congressman Aderholt supporting our efforts to preserve the Union Chapel Mine. We appreciate all that Jerry did for us both on preserving the Union Chapel Mine and in producing this monograph. His experience is an inspiration to all track enthusiasts.

In addition to Jerry MacDonald, the APS is grateful to Hartmut Haubold, Director of the Institute of Geological Sciences and Geiseltalmuseum, Martin-Luther-University, Germany; Spencer G. Lucas, Curator of Paleontology, New Mexico Museum of Natural History and Science; Hans-Dieter Sues, former President of the Society of Vertebrate Paleontology; and Jose A. Gámez Vintaned, Curator, Paleontological Museum, University of Zaragoza, Spain, for also writing letters in support of our efforts to preserve the Union Chapel Mine.

The APS would like to thank the following local, state, and other officials who were instrumental in making the preservation of the Union Chapel Mine a reality:

Robert Aderholt, District 4 Congressman, Jasper, Alabama
 Pete Conroy, Director, Cahaba-Warrior-Coosa (CaWaCo) Resource Conservation and Development
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We are grateful to the following reporters for making the state and the world aware of the unique and remarkable fossils being found at the Union Chapel Mine: John Anderson (*The Huntsville Times*), Claire Bourne (*USA Today*), Joe Bryant (*The Crimson White*), Robert DeWitt (*The Tuscaloosa News*), Kent Faulk (*The Birmingham News*), Ed Howell (*The Jasper Daily Mountain Eagle*), Megan Sever (*Geotimes*), Tom Spencer (*The Birmingham News*), Eric Stokstad (*Science*), and Mike Toner (*The Atlanta-Journal Constitution*).

The first three "Track Meets" used to document the trace fossils from the Union Chapel Mine were sponsored by several institutions. The APS thanks Richard Diehl, Director of the Alabama Museum of Natural History, G. E. Hooks III, former Curator of Vertebrate Paleontology at the Alabama Museum of Natural History, Dan Spaulding, Director of the Anniston Museum of Natural History, and Berry H. ("Nick") Tew, Jr. and Lewis S. Dean of the Geological Survey of Alabama, for providing space for Track Meets 1 and 3. The APS also thanks the staff of Oneonta High School for hosting Track Meet 2.

The following collectors contributed to the photographic database of Union Chapel Mine fossils: Ashley Allen, T. Prescott Atkinson, David Ausmus, Gerald Badger, Ronald J. Buta, David Claybourn, Gary Dennison, Enrique Gomez, Daniel and Larry Hensley, Ken Hoyle, Martha Ivey, James A. Lacefield, Vicki Lais, David C. Kopaska-Merkel, Marie Krchak, Don McDonald, Bruce Minkin, Steven C. Minkin, Bruce A. Relihan, Andrew K. Rindsberg, Michael Robitaille, Jay Tucker, and Kathy Twieg.

The papers in this monograph were reviewed both internally and externally. The Editors would like to thank all reviewers: T. Prescott Atkinson (University of Alabama at Birmingham), Luis A. Buatois (University of Saskatchewan), Richard E. Carroll (Geological Survey of Alabama), Robert A. Gastaldo (Colby College), Michael A. Gibson (University of Tennessee at Martin), David Gillette (Museum of Northern Arizona), Hartmut Haubold (Martin-Luther-University), G. E. Hooks III (currently Longwood University), Ed Jarzembowski (University of Reading), Conrad C. Labandeira (Smithsonian National Museum of Natural History), Martin G. Lockley (University of Colorado at Denver), James R. Lowery (University of Alabama at Birmingham), Spencer G. Lucas (New Mexico Museum of Natural History and Science), Robert B. MacNaughton (Geological Survey of Canada), Jerry MacDonald (Las Cruces, New Mexico), M. Gabriela Mángano (University of Saskatchewan), Steven Manchester (Florida Museum of Natural History), Richard T. McCrea (University of Alberta), W. Edward Osborne (Geological Survey of Alabama), Jack C. Pashin (Geological Survey of Alabama), T. Markham Puckett (then University of Alabama), Emma C. Rainforth (Ramapo College of New Jersey), Andrew J. Ross (Natural History Museum, London), Robert M. Sullivan (State Museum of Pennsylvania), Lauren Tucker (then University of Birmingham), and Kate Zeigler (University of New Mexico). This has insured a high quality for the monograph. We are especially grateful to Rita Lueth for proofreading the entire document on short notice.

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Most of the trackway atlas photographs in this monograph were taken by Ron Buta, but some were also taken by Larry A. Herr and T. Prescott Atkinson. Track Meet lighting was graciously provided by Rickey Yanaura, University Relations, University of Alabama.

The APS is also grateful to John Southard, a local resident whose house lay on an alternate entry point to the mine. Mr. Southard not only allowed us to pass his house, he also often invited us inside for conversation, cold drinks, and garden vegetables. Mr. Southard's kindness and enthusiasm are legendary among APS members.

Ron Buta would like to thank his wife, Deborah A. Crocker, Unix System Project Leader, Seebeck Computer Center, University of Alabama, for her invaluable help on many facets of this project, and James and Faye Lacefield, University of North Alabama, for their advice, encouragement, and helpfulness on the preparation of this document. Ron would also like to thank David L. Block, University of the Witwatersrand, Johannesburg, South Africa, for hosting a very productive astronomical research visit in 2000, and at the same time for arranging for Ron to meet with researchers at the Bernard Price Institute for Paleontological Research on the campus of the university. This visit brought Ron's attention to the discovery of Permian trackways in New Mexico. Ron would especially like to thank Bruce Rubidge, Director of the Bernard Price Institute for Paleontological Research, for allowing him to give a seminar on the Union Chapel Mine fossils at the Institute on November 4, 2002, and for graciously taking him on a personal tour of the excellent Karoo fossil collection housed at the Institute. Ron is also grateful to François Durand, Department of Zoology, Rand Afrikaans University, Johannesburg, and President of the South African Society for Amateur Paleontologists, for the several times his organization allowed Ron to participate in their gatherings and to speak on Alabama fossils, and for being such a dynamic spokesperson on South African paleontology.

Ron also thanks Sam Kindervater, a former president of the Birmingham Paleontological Society and also a former employee of the McWane Science Center, Birmingham, Alabama, for inviting him in July, 2002 to participate in the "Scientist at the Center" program, where Ron and other APS members gave a public presentation on the Union Chapel Mine discoveries.

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In Memoriam: Steven C. Minkin 1947-2004



On February 20, 2004, our friend and colleague Steven C. Minkin, an enthusiastic collector of Union Chapel Mine trackways, a supporter of the Union Chapel Mine preservation effort, and a contributor to this monograph, died after a tragic accident at his home in Anniston, Alabama. With sorrow, and in admiration of his contributions to Alabama ichnology, we honor his memory with this page in the monograph.

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