

GEOLOGY OF THE CHAMA BASIN

Editors

Spencer G. Lucas

Kate E. Zeigler

Virgil W. Lueth

Donald E. Owen



New Mexico Geological Society
Fifty-sixth Annual Field Conference
September 21-24, 2005





Copyright © 2005 by the New Mexico Geological Society, Inc.

The articles and roadlogs in this guidebook were prepared for the 56th annual field conference of the New Mexico Geological Society. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the New Mexico Geological Society, Inc.

The New Mexico Geological Society is a tax-exempt corporation registered in the State of New Mexico that promotes interest in geology and associated sciences, fosters scientific research and publications, encourages cooperation among its members, and stimulates interest in New Mexico geology. These goals are met through annual fall field conferences held in different locations in New Mexico or adjoining states and annual spring meetings, generally held in Socorro, New Mexico, where oral and poster presentations on different aspects of New Mexico geology are given.

New Mexico Geological Society, Inc.
801 Leroy Place
S o c c o r r o , N e w M e x i c o 8 7 8 0 1
<http://geoinfo.nmt.edu/nmgs/home.html>

Design, Layout, & Production: Virgil W. Lueth

Front Cover Photograph: The bluffs next to Ghost Ranch by Spencer G. Lucas

Back Cover Photograph: Aerial photograph of Orphan Mesa near Ghost Ranch by Andrew **B. Heckert**

Inside Front Cover: Digital elevation map of the Chama Basin, courtesy of Lewis Gillard and Mark Mansell, New Mexico Bureau of Geology and Mineral Resources

Artwork: Louann Jordan

Title Page: Portion of Drawing of Cerro Pedernal from Newberry (1876) modified by Virgil W. Lueth

Inside Back Cover: Stratigraphic charts by Kate E. Zeigler and Spencer G. Lucas

Digital Elevation Route Maps: Virgil W. Lueth and Lewis Gillard

Logistical Assistance: Mark Mansel and David McCraw, New Mexico Bureau of Geology and Mineral Resources

Photography & Figures: Spencer G. Lucas, Andrew B. Heckert, Daniel J. Koning, Kate E. Zeigler, Donald E. Owen, and Virgil W. Lueth.

Printer: Starline Printing, Albuquerque, NM

ISBN NO. 1-58546-091-5

ISSN NO. 0077-8567

56th Annual Fall Field Conference Guidebook

First Edition 2005

Printed in the U.S.A.

C O M M I T E E S

2005 EXECUTIVE COMMITTEE

President - Jeffrey M. Amato	New Mexico State University
Vice President - Jennifer Lindline	New Mexico Highlands University
Treasurer - Lewis Land	New Mexico Bureau of Geology & Mineral Resources
Secretary - Andrew B. Heckert	New Mexico Museum of Natural History and Science
Past President - Maureen Wilks	New Mexico Bureau of Geology and Mineral Resources

FIELD CONFERENCE

Spencer G. Lucas	New Mexico Museum of Natural History and Science
Kate E. Zeigler	University of New Mexico
Donald E. Owen	Lamar University, Beaumont, TX

GUIDEBOOK

Spencer G. Lucas	New Mexico Museum of Natural History and Science
Kate E. Zeigler	University of New Mexico
Donald E. Owen	Lamar University, Beaumont, TX
Virgil W. Lueth, Managing Editor	New Mexico Bureau of Geology and Mineral Resources

ROAD LOGS

Spencer G. Lucas, Chair	New Mexico Museum of Natural History and Science
Andrew B. Heckert	New Mexico Museum of Natural History and Science
Kate E. Zeigler	University of New Mexico
Donald E. Owen	Lamar University, Beaumont, TX
Daniel J. Koning	New Mexico Bureau of Geology and Mineral Resources
Adrian P. Hunt	New Mexico Museum of Natural History and Science
Brian S. Brister	New Mexico Bureau of Geology and Mineral Resources
Larry S. Crumpler	New Mexico Museum of Natural History and Science
Justin A. Speilmann	Dartmouth College
Florian Maldonado	United States Geological Survey
William R. Berglof	University of Maryland

REGISTRATION

Ryan Wood	New Mexico Bureau of Geology and Mineral Resources
Lynne Hemenway	New Mexico Bureau of Geology and Mineral Resources

LOCAL ARRANGEMENTS

Kate E. Zeigler	University of New Mexico
Spencer G. Lucas	New Mexico Museum of Natural History and Science

PUBLICATIONS COMMITTEE

Maureen Wilks, Chair	New Mexico Bureau of Geology and Mineral Resources
----------------------------	--

PUBLICATIONS SALES

Maureen Wilks	New Mexico Bureau of Geology and Mineral Resources
Ryan Wood	New Mexico Bureau of Geology and Mineral Resources
Lynne Hemenway	New Mexico Bureau of Geology and Mineral Resources

CONTENTS

Dedication	vi
President's Message	vii
Conference Organizers' Message	viii
Field Conference Schedule	ix

ROAD LOGS

RIO GRANDE RIFT TO THE COLORADO PLATEAU - First-day road log from Espanola to Abiquiu, Youngsville, Coyote, Gallina, and Ghost Ranch <i>Spencer G. Lucas, Daniel J. Koning, Andrew B. Heckert, Kate E. Zeigler, Adrian P Hunt,</i> <i>Donald E. Owen, Florian Maldonado, and William Berglof</i>	1
MINIPAPERS	
Quaternary terrace deposits along the lower Rio Chama and the Rio Chama-Rio Grande confluence: Stratigraphic relations and possible displacement by the Santa Clara fault	<i>Daniel Koning</i> 6
Pliocene geologic features at the top of southern Black Mesa, Espanola Basin, and a peculiar alignment of topographic knobs in Servilleta Basalt	<i>Daniel J. Koning, Shari Kelley, and Kirt Kempter</i> 9
Dams and lakes of the Chama Basin area	<i>Donald E. Owen</i> 15
Preliminary magnetostratigraphic data from the Upper Triassic Polco Formation (Chinle Group) at Abiquiu Dam, north-central New Mexico	<i>Kate E. Zeigler, John W. Geissman, and Spencer G. Lucas</i> 17
The Youngsville mammoth	<i>Spencer G. Lucas, Gary S. Morgan, and Andrew Heckert</i> 19
Vertebrate biostratigraphy of the Upper Triassic Salitral Formation, Chinle Group, north-central New Mexico	<i>Kate E. Zeigler; Spencer G. Lucas, Justin A. Spielmann, and Vincent Morgan</i> 20
Taphonomy of the Early Permian Cardillo Quarry, Chama Basin, north-central New Mexico	<i>Kate E. Zeigler, Spencer G. Lucas, Amy Henrici, and David Berman</i> 22
Friedrich von Huene and Triassic stratigraphy in the Chama Basin, New Mexico.....	<i>Spencer G. Lucas</i> 24
E. D. Cope and the first discovery of Triassic vertebrate fossils in the American west	<i>Spencer G. Lucas, Adrian P Hunt, and Andrew B. Heckert</i> 26
Menefee Formation at the Gallina Hogback.....	<i>Michael Iacoboni</i> 28
A model for Laramide tectonic development of the Nacimiento-Gallina region	<i>Steven M. Cather</i> 29
New Mexico's Triassic dinosaur district	<i>Andrew B. Heckert, Spencer G. Lucas, Robert M. Sullivan, and Adrian P Hunt</i> 34
The saga of <i>Coelophysis</i>	<i>Spencer G. Lucas, Robert M Sullivan, Adrian P Hunt, and Andrew B. Heckert</i> 37
MESOZOIC STRATIGRAPHY OF THE CHAMA BASIN - Second-day road log from Ghost Ranch to Tierra Amarilla and Chama	<i>Spencer G. Lucas, Andrew B. Heckert, Kate E. Zeigler, Donald E. Owen, and Adrian P Hunt</i> 39
MINIPAPERS	
Fossils at Ghost Ranch: The Ruth Hall Museum of Paleontology Collection	<i>Andrew B. Heckert, Spencer G. Lucas, Alex Downs, and Adrian P Hunt</i> 40
Taphonomy and sedimentology of the Upper Triassic Canjilon Quarry (Painted Desert Member of Petrified Forest Formation, Chinle Group), Chama Basin, north-central New Mexico, and a comparison with the Snyder Quarry	<i>Jeffery W Martz and Kate E. Zeigler</i> 41
New fossil fish locality in the Middle Jurassic Todilto Formation at Ghost Ranch, north-central New Mexico	<i>Adrian P Hunt, Spencer G. Lucas, and Alex Downs</i> 45
The Snyder Quarry: A fire-related Upper Triassic fossil assemblage in north-central New Mexico	<i>Kate E. Zeigler</i> 48
J.S. Newberry and the geology of the Chama Basin.....	<i>Spencer G. Lucas</i> 53
The unsung revolt in Tierra Amarilla	<i>Donald E. Owen, Jr</i> 55
THE SAN JUAN VOLCANIC FIELD AND CRETACEOUS DEPOSITIONAL SYSTEMS - Third-day road log from Chama to Cumbres Pass, Los Brazos, and Heron Lake <i>Spencer G. Lucas, Andrew B. Heckert, Kate E. Zeigler, Donald E. Owen,</i> <i>Adrian P Hunt, Brian S. Brister, Larry S. Crumpler, and Justin A. Spielman?</i>	57
MINIPAPERS	
Cooper Arroyo Sandstone Member of the Mancos Shale (Cretaceous) of the Chama Basin, New Mexico	<i>Spencer G. Lucas</i> 64
The San Juan-Chama Project.....	<i>Kristan Cockerill</i> 65

TIERRA AMARILLA TO EL VADO DAM - Third-day supplemental road log	<i>Spencer G. Lucas, Donald E. Owen, Kate E. Zeigler, Adrian P Hunt, and Andrew B. Heckert</i>	69
ROAD LOG REFERENCES		71

COLOR PLATES

Sixteen color plates that supplement the road logs and articles	77
---	----

ARTICLES

Structure and Tectonics

Regional tectonic inferences for the 1.4 Ga-Holocene lateral slip history of the Picuris-Pecos and related faults, northern, New Mexico.....	<i>Steven M Cather, Michael Timmons, and Karl E. Karlstrom</i>	93
--	--	----

Geophysics

Gravity and flexure models of the San Luis, Albuquerque, and Tularosa Basins in the Rio Grande Rift, New Mexico and southern Colorado	<i>Chloe Peterson and Mousumi Roy</i>	105
Paleomagnetism and magnetostratigraphy of the Upper Triassic Petrified Forest and Poleo Formations, north-central New Mexico, and the Bluewater Creek and lower Petrified Forest Formations, central New Mexico	<i>Kate E. Zeigler; John W Geissman, and Spencer G. Lucas</i>	115

Stratigraphy and Sedimentology

The Pennsylvanian section at Chaves Box, Rio Arriba County, New Mexico	<i>Spencer G. Lucas, Barry S. Kites, Kate E. Zeigler; and Karl Krainer</i>	129
Lithofacies of the Pennsylvanian Osha Canyon Formation at the type section, Jemez Mountains, New Mexico	<i>Karl Krainer and Spencer G. Lucas</i>	139
Stratigraphy and correlation of the Permo-Carboniferous Cutler Group, Chama Basin, New Mexico	<i>Spencer G. Lucas and Karl Krainer</i>	145
Mesozoic stratigraphy at Durango, Colorado	<i>Spencer G. Lucas and Andrew B. Heckert</i>	160
Review of Upper Triassic stratigraphy and biostratigraphy in the Chama Basin, northern New Mexico	<i>Spencer G. Lucas, Kate E. Zeigler; Andrew B. Heckert, and Adrian P Hunt</i>	170
Jurassic stratigraphy in the Chama Basin, northern New Mexico.....	<i>Spencer G. Lucas, Adrian P Hunt, and Justin Spielmann</i>	182
Dakota outcrop geology and sequence stratigraphy, Chama Basin, New Mexico	<i>Peter Varney</i>	193
Surface and subsurface stratigraphy of the Burro Canyon Formation, Dakota Sandstone, and intertongued Mancos Shale of the Chama Basin, New Mexico	<i>Donald E. Owen, Angel ique M Forgas, Shawn A. Millet; Ryan J. Stelly, and Donald E. Owen, Jr</i>	218
The White Rock Mesa Member of the Dakota Sandstone (Cretaceous) of the San Juan Basin, New Mexico and Colorado -A formal new lithostratigraphic unit to replace the informal "Dakota main body"	<i>Donald E. Owen and Donald E. Owen, Jr</i>	227
Age of the Cretaceous Menefee Formation, Gallina Hogback, Rio Arriba County, New Mexico	<i>Spencer G. Lucas, Justin A. Spielmann, Dennis R. Braman, Brian S. Brister, Lisa Peters, and William C. McIntosh</i>	231
Stratigraphy and depositional trends in the Santa Fe Group near Espanola, north-central New Mexico: Tectonic and climatic Implications	<i>Daniel Koning, Sean D. Connell, Gary S. Morgan, Lisa Peters, and William C. McIntosh</i>	237
Proposed members of the Chamita Formation, north-central New Mexico	<i>Daniel I Koning and Scott B. Aby</i>	258

Paleontology and Biostratigraphy

Trackway of a giant <i>Arthropleura</i> from the Upper Pennsylvanian of El Cobre Canyon, New Mexico	<i>Spencer G. Lucas, Allan J. Lerner, Joseph T Hannibal, Adrian P Hunt, and Joerg W Schneider</i>	279
Nonmarine bivalves from the Lower Permian (Wolfcampian) of the Chama Basin, New Mexico	<i>Spencer G. Lucas and Larry F Rinehart</i>	283

Early Permian vertebrate assemblage and its biostratigraphic significance, Arroyo del Agua, Rio Arriba County, New Mexico <i>Spencer G. Lucas, Susan K. Harris, Justin A. Spielmann, David S. Berman, Amy C. Henrici, Andrew B. Heckert,</i> <i>Kate E. Zeigler, and Larry E. Rinehart</i>	288
Taphonomy of the Lower Permian Cardillo Quarry, Chama Basin, north-central New Mexico <i>Kate E. Zeigler, Spencer G. Lucas, Andrew B. Heckert, Amy C. Henrici, and David S. Berman</i>	297
The vertebrate fauna of the Upper Triassic (Revueltian: Lower-Mid Norian) Painted Desert Member (Petrified Forest Formation: Chinle Group) in the Chama Basin, northern New Mexico <i>Andrew B. Heckert, Spencer G. Lucas, Robert M. Sullivan, Adrian P. Hunt, and Justin A. Spielmann</i>	302
The microvertebrate fauna of the Upper Triassic (Revueltian) Snyder Quarry, north-central New Mexico <i>Andrew B. Heckert and Hillary S. Jenkins</i>	319
Vertebrate fauna of the Upper Triassic Mesa Montosa Member (Petrified Forest Formation, Chinle Group), Chama Basin northern New Mexico <i>Kate E. Zeigler, Spencer G. Lucas, and Vincent L. Morgan</i>	335
Taphonomic analysis of a fire-related Upper Triassic vertebrate fossil assemblage from north-central New Mexico <i>Kate E. Zeigler, Andrew B. Heckert, and Spencer G. Lucas</i>	341
The Hayden Quarry, a new Upper Triassic fossil locality at Ghost Ranch, New Mexico <i>Alex Downs</i>	355
Definition and correlation of the Lamyan: A new biochronological unit for the nonmarine Late Carnian (Late Triassic) <i>Adrian P. Hunt, Spencer G. Lucas, and Andrew B. Heckert</i>	357
Distribution and biochronology of <i>Camarasaurus</i> (Dinosauria, Sauropoda) from the Jurassic Morrison Formation of the Rocky Mountain region <i>Takehito Ikejiri</i>	367
Stromatolites in the Todilto Formation? <i>Dana Ulmer-Scholle</i>	380
The Mosasaur <i>Prognathodon</i> from the Upper Cretaceous Lewis Shale near Durango, Colorado and the distribution of <i>Prognathodon</i> in North America <i>Spencer G. Lucas, Takehito Ikejiri, Heather Maisch,</i> <i>Thomas Joyce, and Gary Gianniny</i>	389
Dinosaurs, pollen, and the Cretaceous-Tertiary boundary in the San Juan Basin, New Mexico <i>Robert M. Sullivan, Spencer G. Lucas, and Dennis R. Brannum</i>	395
Late Hemphillian (Late Miocene) vertebrate fauna from the Black Mesa Quarry, Chamita Formation, Rio Arriba County, New Mexico <i>Gary S. Morgan, Daniel J. Koning, and Spencer G. Lucas</i>	408
Pleistocene vertebrates from Rio Arriba and Taos Counties, northernmost New Mexico. <i>Gary S. Morgan and Spencer G. Lucas</i>	416

Quaternary Geology and Geoarcheology

The geological and geoarchaeological significance of Cerro Piedernal, Rio Arriba County, New Mexico <i>Gary A. Smith and Bruce B. Huckell</i>	425
Contrasts in Late Pleistocene to Holocene fluvial behavior along the middle Rio Chama <i>Lyman Persico, Grant Meyer, Jed Frechette, Jennifer New, and Chris Hepler</i>	432

Economic Geology

Insights into the petroleum geology and stratigraphy of the Dakota interval (Cretaceous) in the San Juan Basin, northwestern New Mexico and southwestern Colorado <i>Charles F. Head and Donald E. Owen</i>	434
Mineral deposits in Rio Arriba County, New Mexico <i>Virginia T. McLemore and Gretchen Hoffman</i>	445

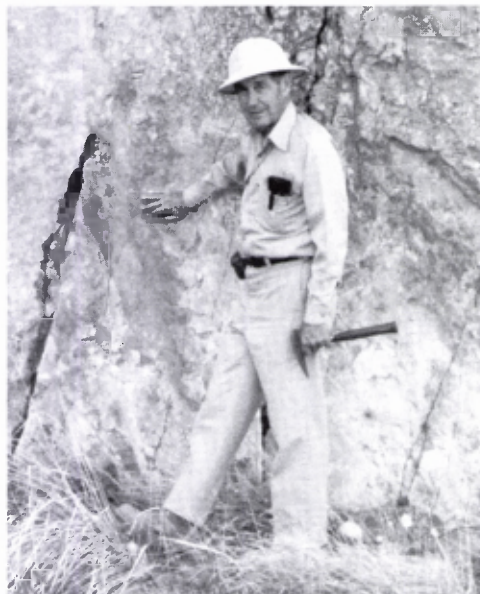
DEDICATION

CLAY T. SMITH

It is my great honor to dedicate the Ghost Ranch II guidebook to one of New Mexico's best, Dr. Clay T. Smith. Known affectionately to many as "Clay T." or "Clay," Dr. Smith was very active in many areas of the profession of geology at home and abroad, but he was especially active in New Mexico. As one of the earliest members of the New Mexico Geological Society, his contributions to the science and profession are many and varied. Clay was heavily involved in the first Ghost Ranch volume. It is fitting we dedicate this volume to him.

Clay Taylor Smith was born in Omaha, Nebraska, on July 30, 1917, and raised in California. Following High School, Clay attended The California Institute of Technology, where he received his Ph.D. in Economic Geology with a minor in Paleontology in June 1943. While attending Cal Tech, Clay worked part time for the U.S. Geological Survey mapping chromite deposits and complex stratigraphic relationships in the Jurassic sequence as part of his thesis and dissertation research work. This proved to be a fortuitous relationship. During his college years, Clay joined the Marine ROTC at Cal Tech to help with college funding. When Clay graduated with his doctorate, the United States was deeply involved in World War Two, and Clay was still in the Marine Reserves. Because the Marines always need some good men, Clay was promptly snapped up (this explains those "slick" Marine hairs cuts Clay sported while a Professor at New Mexico Tech.) Fortunately for us, the Government had other ideas. While in Boot Camp, Clay was ordered to his commandant's office where he was told to pack his belongings and change to civilian clothes. He would be told his assignment later. He had been transferred from the Marines to the top-secret Manhattan Project, where he spent the rest of the war mapping and sampling strategic mineral deposits in western North America with emphasis on uranium deposits in the Jurassic of the Four Corners Region.

In 1946, one of Clay's former professors told him of an opening for an Assistant Professor at the New Mexico School of Mines (later New Mexico Institute of Mining and Technology) in Socorro. In 1947, Clay and Sallie moved to Socorro. Clay's first assignment was as Assistant Professor of Engineering and Acting Head of the Department of Engineering where he taught Mineral Economics, Petroleum Engineering and Mining Engineering. He soon moved to the Geology Department as an Assistant Professor. He taught many courses including Physical Geology, Historical Geology, Mineralogy, Petrology, Petrography, Stratigraphy, Field Mapping, Field Camp, Ore Deposits, Mineral Economics and Value Theory/Land Valuation, to mention just a few. His primary



Clay Smith at Rancho de las Canas near Socorro in the early 1990s.

specialties were Mineralogy, Ore Deposits, Economic Evaluations and Field Geology. He ran many of the Field Camps for Tech and was responsible for the field training of many geologists. As one of the last great "generalist" geologists, Clay was involved in many areas of the science, but he was primarily a field man. He taught us early on that geology was first and foremost a field science with lab analysis of the data in a critical but important support role.

My first encounter with Clay Smith was in Physical Geology lecture and lab in 1971. We went out on a field trip with Clay one weekend to look at the Pennsylvanian strata east of Socorro. There, in the lead, was his field companion, Sedgwick the dog. Clay always said Sedgwick was a much better geologist than he since he was much closer to the ground. Therefore, the dog saw much more of the detail. After my graduation in 1975, we maintained a

close professional and personal relationship, spending much time in the field together mapping or working on consulting projects together for years.

Student humor about Clay was ubiquitous. He was well aware of this and bore it with a quiet grace and humor. As freshmen, we were "fed" the rumor that Clay was actually quite ancient (somewhere over 70), although he looked very fresh (possibly early forties). We were told not to ask him because he was supposedly quite severe and would toss us out of his office after flunking us out of his course. Obviously, he was never like that at all, but we did not know that at the time. Finally, several of us worked up the courage and asked him. He laughed and told us his age. Students also knew he was an expert on rock and mineral identification. It comes as no surprise that there were many who tried to "pull a fast one" on Clay. While in the field east of Socorro one day, I asked Clay about this. He laughed and related how some graduate students had ground up a bunch of different rocks and a few minerals, combined it with wheat flour, sugar, and water and baked the resulting paste into a "rock sample." After thin-sectioning the "mystery rock", the slide and "hand specimen" were presented to him for identification. He identified it alright – it was "Flourite." He told them what was in it, returned the hand specimen and went on with his work, much to the chagrin of the pranksters.

As an expert in minerals, ore deposits and economic geology, Clay's expert testimony was widely sought in disputes and litigations. A thorough investigator, his opinion weighed heavily in court decisions. He was responsible for quietly exposing several scams and correcting the overstated ore reserve calculations usually found in mining property promotional literature.

Clay believed in all of his students and followed their careers with great interest. He never forgot a name or face. He was an enthusiastic supporter of each of his graduate students and expected them to develop new ideas and interpretations within the constraints of the data. Much of the financial support came through his consulting projects. He was never harsh, but could be very direct and honest without being nasty. He could be quite severe and demanding when faced with what he viewed as mediocrity or bad science, yet remained open and flexible to new ideas or concepts. He taught all of us that life was not “fair,” so if we were to succeed, we had better perform.

Clay promoted a broader interest in geology and other earth sciences through his activities with the State Science and Engineering Fair (he was twice its Director) and Visiting Professor Programs for the school. In 1983, he served as General Chair of the International Science and Engineering Fair held in Albuquerque. He was also active in numerous professional societies. These include: Fellow of the Geological Society of America, Fellow of the Society of Economic Geologists, Charter Member of the New Mexico Geological Society, Charter Member of the American Institute of Professional Geologists and Certified Pro-

fessional Geologist, Fellow of the American Association for the Advancement of Science, Member of the National Association of Geoscience Teachers, Life Member of the New Mexico Academy of Science and Member of Sigma Xi, New Mexico Tech Chapter. He was also active in the local community through the Lions Club (I still remember the pancakes on Labor Day Weekend) and as Treasurer for the Friends of the Bosque Del Apache National Wildlife Refuge. A lifelong athlete, Clay was dedicated to athletics in the State of New Mexico, officiating high school football and basketball games throughout the State. After 40 years of continuing service, he was inducted into the New Mexico Official Association’s Hall of Fame in 1987.

To the very last, Clay was a quiet, humble, Christian gentleman who never sought attention or recognition. He worked hard and accomplished much. To the very last, he did what he loved the most – worshipped God, taught geology and watched football. While watching Monday Night Football, Clay was stricken with a cerebral hematoma and fell into a deep coma. He slipped into Eternity on November 10, 2003. We will all miss his energy and enthusiasm for the profession and science. Adios mi Maestro, Professor, Amigo y Compañero del Campo – Vaya con Dios. ¡Hasta la Vista!

Robert M. Colpitts

PRESIDENT’S MESSAGE

The 56th New Mexico Geological Society Fall Field Conference will be held in the Chama-Ghost Ranch region, previously visited by NMGS in 1960 and in 1974. This year the trip organizers are Kate Zeigler, a graduate student at UNM, and Spencer Lucas, who needs no introduction to many of our members. Spencer organized several past field conferences, including the 2003 trip to the Zuni Plateau. Kate and Spencer will be leading us through the Mesozoic stratigraphy of the area.

Our managing editor, Virgil Lueth, set a high standard for the Fall Field Conference guidebooks with his innovations in the 2004 Taos region guidebook. He has done another superb job with this year’s volume. As always, the quality of the publications matches their presentation. All of our guidebooks remain in print, but we are going to digitize some of the books that are becoming rare. If you are looking to complete your guidebook collection with real books, you might want to contact our publications department soon and they will be happy to help you. In the near future, purchases of the older guidebooks will be made in the form of a compact disc.

Speaking of publications, at the end of 2004 NMGS published *The Geology of New Mexico-A Geologic History* (NMGS Special Publication #11) edited by Greg Mack and Kate Giles of New Mexico State University. This volume is the definitive work on the geology of New Mexico and should be part of every NMGS member’s library. In addition, the updated Geologic Highway Map of New Mexico is now published. This is one of our most popular publications and continues to educate people about the geology of New Mexico. As always, students will receive a 35% discount on all Society publications, as well as free membership to NMGS.

The New Mexico Geological Society Foundation continues to award scholarships to the students of New Mexico, the amount of which has increased each year since I have served on the Executive Committee. In 2005 we are budgeted to award \$41,900 in student scholarships, an increase of 20% from last year. We thank the Board of the Foundation, headed by Paul Catacosinos, for their continued support.

Nelia Dunbar and Shari Kelley chaired the Spring Meeting this year. Many thanks go to them and all of the volunteers who helped make this meeting a success. The next few Fall Field Conferences include: 2006 - Carlsbad, 2007 - Jemez Mountains, and 2008 - Gila Wilderness area. The Society welcomes your suggestions for future conferences.

Many thanks go to everyone who helped with NMGS this year, including Maureen Wilks, Adam Read, Bob Myers, Lynn Hemenway, Ryan Wood, and many others. Finally, we are always looking for volunteers to serve on the Executive Committee or to help run the Spring Meeting. If you have been attending our events for years or are a new member, perhaps now is a good time to get involved!

Jeffrey M. Amato

CONFERENCE ORGANIZERS' MESSAGE

New Mexico's Chama Basin can be defined physiographically as the drainage basin of the Chama River and its principal tributaries (especially the Rio Gallinas and Arroyo Seco) in Rio Arriba County. Defined geologically, the Chama Basin is a portion of the eastern Colorado Plateau between the eastern edge of the San Juan Basin, the southern edge of the San Juan volcanic field, the northern edge of the Jemez volcanic field and the western edge of the Rio Grande rift. However you define the Chama Basin, it offers some of New Mexico's finest geological scenery, from the coal-bearing Cretaceous strata of the Gallina hogback to the cliffs of Jurassic sandstones and red badlands of the upper Triassic at Ghost Ranch (the subjects of many paintings by famous artist Georgia O'Keefe), to the Cretaceous sandstone ledges and vast shale slopes at the Vado of the Rio Chama near Tierra Amarilla.

John Strong Newberry (in 1858) and Edward Drinker Cope (in 1874) first described geological features in the Chama Basin. Nelson H. Darton followed them in the early years of the 20th Century. By the 1960's extensive work by Clay T. Smith (to whom this guidebook is dedicated), William Muehlberger, Carl Dane and their colleagues and students established a diverse understanding of the geology of the Chama Basin. That understanding was well elaborated by the 11th (1960) and 25th (1974) Fall Field Conferences of the New Mexico Geological Society, which focused on the geology of the Chama Basin. Some other Fall Field Conferences of the New Mexico Geological Society have visited parts of the Chama Basin, but this year's conference truly is the third time the New Mexico Geological Society revisits this region.

The Chama Basin is mostly a region of relatively high plateaus and canyons developed in little deformed sedimentary rocks of Pennsylvanian, Permian, Triassic, Jurassic and Cretaceous age. Extensive advances in understanding the stratigraphy, sedimentology and paleontology of these rocks are the theme of most of the articles in this guidebook. The road logs also well reflect this by presenting the results of much of the last two decades of geological research in the Chama Basin.

This conference moves across much of the southern and eastern Chama Basin. It begins outside of the basin in Espanola, then traverses the western Rio Grande rift and southern flank of the Chama Basin to progress to Ghost Ranch at the end of the first day. The second day moves from Ghost Ranch to Chama, and the last day visits Cumbres Pass and locations to the south in the Tierra Amarilla region. We believe that the committee who produced the road logs for these trips has written what are truly detailed and instructive logs. They deserve special thanks: William R. Berglof, Brian S. Brister, Larry S. Crumpler, Andrew B. Heckert, Adrian P. Hunt, Daniel J. Koning, Florian Maldonado, and Justin A. Spielmann. Virgil Lueth's skill as managing editor made this book happen. We also thank the following institutions for diverse support of this guidebook and field conference: New Mexico Museum of Natural History and Science, University of New Mexico, New Mexico Bureau of Geology and Mineral Resources, and Lamar University.

*Spencer G. Lucas
Kate E. Zeigler
Donald E. Owen.*

FIELD CONFERENCE SCHEDULE

Wednesday, September 21, 2005 –Registration Day

6:00 – 9:00 PM Registration and ice-breaker party, OK Casino & Resort, Espanola

Thursday, September 22, 2005 – First Day, Espanola to Ghost Ranch

6:00 – 7:15 AM Breakfast (not provided)

7:00 – 7:30 AM Registration, Northern New Mexico Community College

7:30 AM Caravan leaves Northern New Mexico Community College

6:00 PM Barbeque (provided), Ghost Ranch

Friday, September 23, 2005 – Second Day, Ghost Ranch to Chama

6:00 – 7:15 AM Breakfast (not provided)

7:00 – 7:30 AM Registration, Ghost Ranch

8:00 AM Caravan leaves Ghost Ranch

6:00 PM Caravan arrives at Elk Horn Lodge, Chama

6:00 – 7:00 PM Social hour at Elk Horn Lodge, Chama

7:00 PM Annual Banquet (provided), Elk Horn Lodge, Chama

Saturday, September 24, 2005 – Third Day, Chama to El Vado Dam

6:00 – 7:30 AM Breakfast (not provided)

8:00 AM Caravan leaves Elk Horn Lodge

1:00 PM Conference ends at El Vado Dam, southwest of Chama