New Mexico Geological Society

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Front Matter

(Usually includes Dedication, President's Message, & Conference Organizer's Message.)

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This is a section from the 1995 NMGS Fall Field Conference Guidebook.

Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual Fall Field Conference that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

Free Downloads

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

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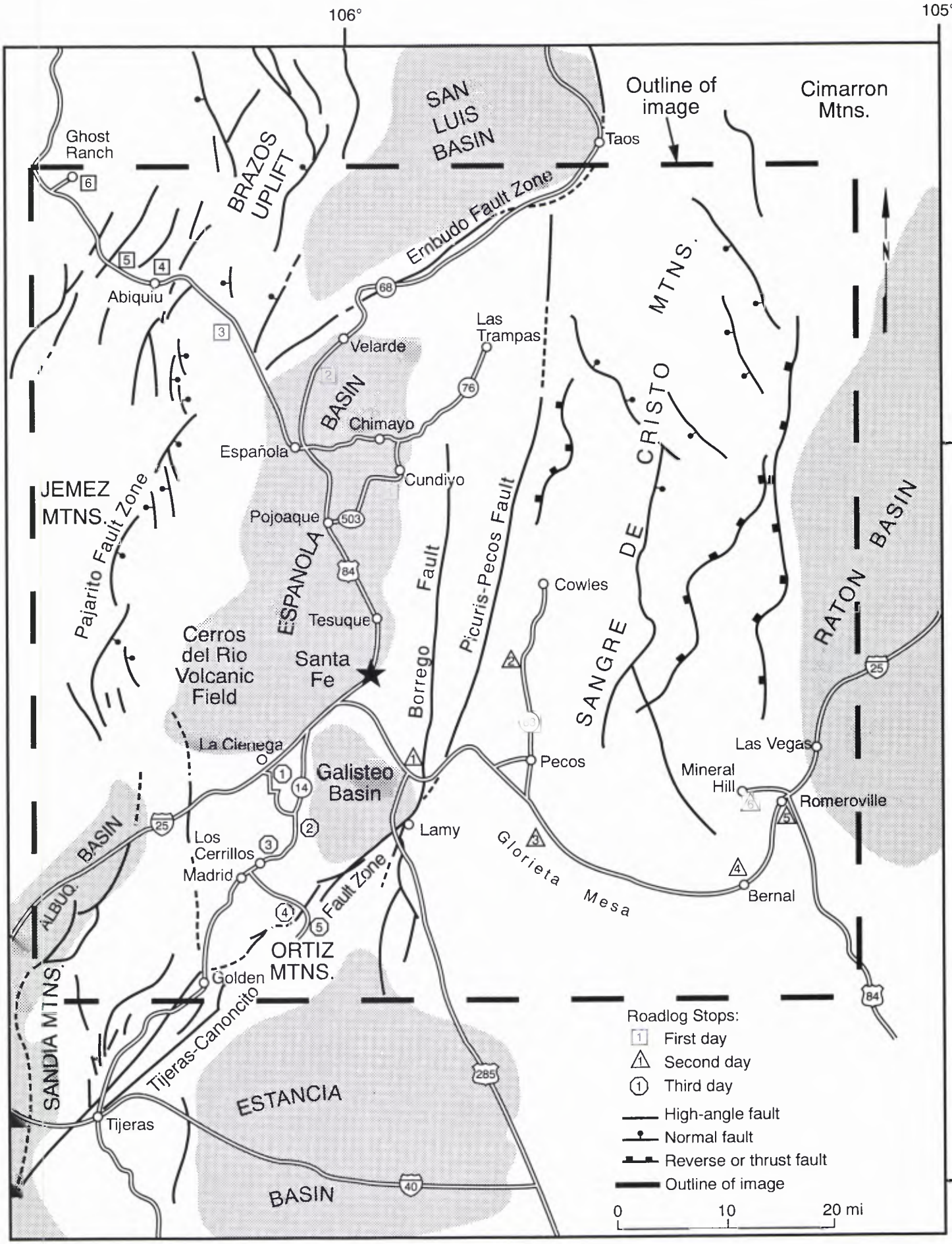
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Cundiyo
JEMEZ MTNS.
Pajarito Fault Zone
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Cowles
RATON BASIN
Tesuque
Cerros del Rio Volcanic Field
Santa Fe
Borrego
La Cienega
Galisteo Basin
Pecos
Las Vegas
Mineral Hill
Romeroville
Lamy
Los Cerrillos
Madrid
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Sangre de Cristo Mountains, looking southeast from US-84/285, 1.5 miles north of Pojoaque, New Mexico. Photograph taken several hundred yards east of highway, and this view is not visible from the highway proper. Arroyos in foreground are cut in Quaternary alluvium. Ridges and small mesas in middle ground are underlain by Santa Fe Group. High level Borrego pediment is visible about midway up mountain side. Photo by Wayne Lambert, February 19, 1978, afternoon.

GEOLOGY OF THE SANTA FE REGION, NEW MEXICO

Editors

PAUL W. BAUER
BARRY S. KUES
NELIA W. DUNBAR
KARL E. KARLSTROM
BRUCE HARRISON

New Mexico Geological Society
Forty-Sixth Annual Field Conference
September 27–30, 1995

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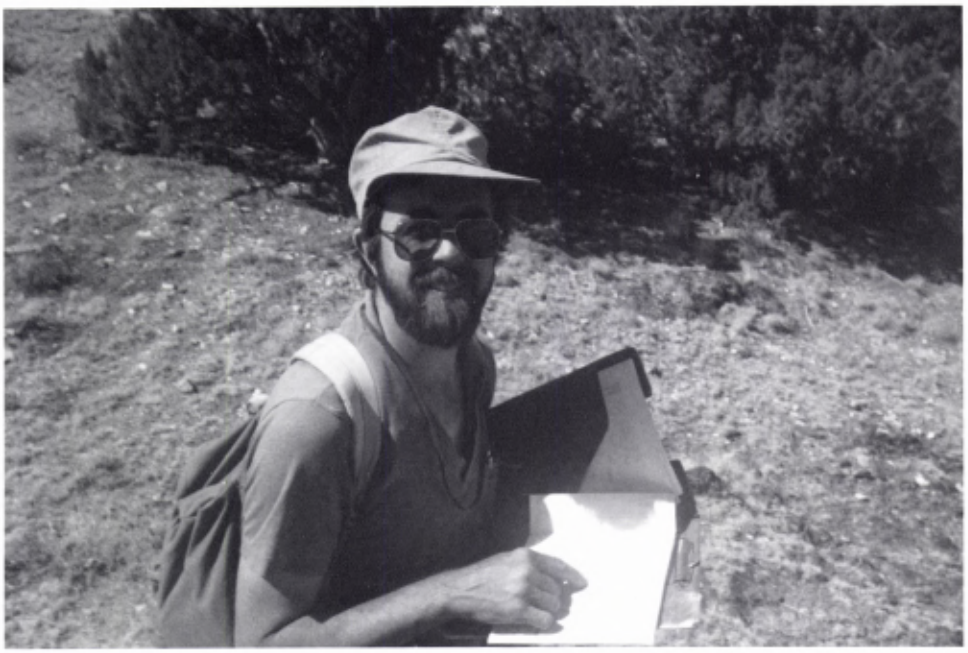
Geomorphology, Hydrogeology and Environmental Geology

DEDICATION

JEFFREY A. GRAMBLING, 1953–1993



This field guide is dedicated to the memory of Jeffrey A. Grambling for his numerous contributions to the geology and the geological community of New Mexico. Jeff began his professional work in the Santa Fe country, and although his interests and his influence quickly expanded, his research and his heart were always close to the Sangre de Cristo Mountains.

Jeff was born in Milwaukee, Wisconsin on April 1, 1953. His family moved to New Jersey, Pennsylvania and Oklahoma before Jeff was eight years old. When he was sixteen, his family moved to Binghamton, New York, where they still live. Jeff attended Colgate University. He started out in mathematics, discovered geology, and finished with a double major in math and geology. After college, Jeff married Gail Johnston, his high school sweetheart. They moved to Princeton where, under the direction of Lincoln Hollister, Jeff completed his Ph.D only four years after graduating from Colgate. Jeff Grambling came to the University of New Mexico in 1980 after one year as an Assistant Professor at the University of Oklahoma. The move allowed him to conveniently incorporate field trips and field research into his teaching, and to develop his lively graduate program focusing on all aspects of the Precambrian terranes of northern and central New Mexico.

Jeff began his Ph.D. research in the Santa Fe Range of northern New Mexico, but ultimately settled in the Truchas Range. There Jeff found the opportunity to combine high country backpacking, complex geology, metamorphic petrology, and especially the aluminum silicate polymorphs kyanite, andalusite, and sillimanite. Jeff's research provided a classic example of metamorphic petrology as a field science. He mapped metamorphic isograds and metamorphic equilibrium as a function of topography and structure, and he made the Truchas Range one of the classic metamorphic localities in the world. Jeff set a pattern during his Ph.D. research that he continued throughout his career. He studied the rocks in order to understand the history and significance of this important geologic region, but he also found ways to use the extraordinary rocks he discovered to illustrate and clarify theoretical aspects of metamorphic petrology. These successes brought Jeff his worldwide reputation. He was always aware of new techniques and new ideas and generally among the first to use them as tools in his own research, and to use field relations as a tool to evaluate the importance of the new ideas. He was one of the first petrologists to use the Gibbs Method in a broad range of applications, including constraining fluid equilibria in the Truchas Range, clarifying aluminum silicate equilibria, and developing a variety of new quantitative petrologic tools for thermobarometry, fluid equilibria, and oxygen barometry. Jeff's research kept him at the heart of controversies concerning the tectonic significance of the Proterozoic terranes of northern New Mexico and the Southwest. He described New Mexico's now well known Al-silicate triple-point assemblages, and he was one of the first to recognize and appreciate the multiphase nature of Proterozoic deformation and metamorphism.

Jeff Grambling was as successful a teacher as he was a researcher, perhaps because his research and teaching were so thoroughly integrated. He was careful, complete and demanding in his undergraduate courses, but his graduate courses were truly inspirational. Jeff managed to incorporate the newest techniques and ideas into his courses, creating an atmosphere of on-going research with the excitement of unknown results worked into continuously evolving lectures and exercises. As an advisor, Jeff was at once demanding, frustrating, supportive, encouraging, discouraging, and most of all, successful. Jeff taught and demonstrated a care in writing, bordering on perfectionism, which is now emulated and taught by his students and their students. Jeff requested and respected the contributions of his

students, and he shared his enthusiasm over new discoveries and successful experiments. His graduate program was a training ground for professional collaboration, and his students have been successful in a wide range of pursuits from industry to academia. Like all great teachers, Jeff's spirit will affect many future generations of students.

Jeff Grambling's contributions to the New Mexico geological community went way beyond his teaching and research. He was an active participant in virtually all NMGS activities and in many ways helped to shape the Society throughout the 1980s. Jeff was elected Secretary of the New Mexico Geological Society in 1982, Treasurer in 1983, and President in 1984. In 1985, he served as Past President of the Executive Committee. He was also co-editor of the 1982 NMGS Guidebook, "Albuquerque Country". After his administrative cycle, Jeff maintained his high visibility in NMGS, attending all of the Fall Field Conferences and Spring Meetings. To say that Jeff continued to participate is certainly an understatement. In addition to his prolific publication record in a variety of international journals, Jeff authored or coauthored five major papers and six road logs with short papers in NMGS Guidebooks. Jeff and his students gave papers at virtually every NMGS Spring Conference, and as is known by every NMGS member, Jeff was an active, stimulating, challenging and thoroughly enjoyable participant in all field and lecture discussions where the geology of New Mexico was concerned.

Back-country hiking and camping were an integral part of Jeff Grambling's research, teaching, and personal life. It seems that each of Jeff's colleagues and each of his students can tell a different story of talus slope field trips, 5000-foot climbs with heavy packs, huddling in tents during week-long deluges, trout fishing, dogs with backpacks, snow on tents, elaborate one pot meals, floods, and most of all, spectacular structures, isograds, and huge porphyroblasts. Jeff Grambling had a profound effect on the lives of his students, his colleagues, his friends, and his science. He taught us about the geology of New Mexico and the world, and he lived his much-too-short life to the fullest. His influence will live and grow in our research and teaching, and in that of our students.

Michael L. Williams

PRESIDENT'S MESSAGE

Autumn in New Mexico is a magic meteorological interlude between summer monsoons and winter blasts. It is traditionally celebrated with outdoor activities such as fiestas, fairs, rodeos, hot-air balloon races and roasting chilis. It is my pleasure to welcome you to historic Santa Fe and another autumnal tradition of the geological community, namely the annual Field Conference of the New Mexico Geological Society, now in its 46th year. Several past presidents of the Society have described the appearance of each new guidebook, and the organization of 100–200 geological enthusiasts into a coherent tour group, as an annual miracle.

This year's chief miracle worker is Dr. Paul Bauer, a vegetable-powered field geologist and dedicated friend of the Proterozoic. As in 1990, Paul has again done double duty as field conference chairman and senior guidebook editor. Muchas Gracias, Paul. In reality, however, NMGS field conferences require an enormous team effort. In addition to quarterback Bauer, this year's editorial backfield, road logging linemen and managers (registrar, logisticians, caravan director and publications people) are listed on the committee page. Please make it a point to thank all of these team members for their many hours of hard work in creating this field conference.

The Society continues to be financially healthy, in spite of a long term recession in the petroleum and minerals industries. Sales of publications, most notably the New Mexico Highway Geological Map and recent guidebooks, provide a steady income of about $40–42,000 per annum. The cost of printing a new guidebook each year, however, has been rising significantly; to help reduce printing and retail guidebook costs the executive committee recently approved soft covers and page limits for guidebooks.

This year the Society will provide approximately $9,300 in scholarships, fellowships, and research grants to outstanding graduate and undergraduate students in New Mexico; this amount also includes student field conference scholarships and awards to high school students at the state science fair. In recognition of their many years as patrons and benefactors of the Society, we are proud to award the Frank Kottlowski Fellowship, the Robert and Beverly Wellnitz Memorial Scholarships, and the Lucille Pipkin Undergraduate Scholarship to excellent earth science students at New Mexico colleges and universities. We also thank the Los Alamos Geological Society for continuing support of field conference scholarships.

As always, the executive committee acknowledges the solid support of the New Mexico Bureau of Mines and Mineral Resources. In particular we owe special thanks to Chuck Chapin, Director of the Bureau and State Geologist, for his advice and support of Society functions. Also, Norma Meeks (Publications) and Debbie Goering (Membership) at the Bureau cheerfully and expertly keep the Society operating smoothly on a daily basis.

The 1995 NMGS spring meeting in Socorro drew an audience of 120 professionals and students; presumably, many were attracted by sessions on Cenozoic basins, diagenesis and water studies. Dave Love, Maureen Wilks and Glen Jones are thanked for their efforts in making the spring meeting a rousing success.

The 1996 Fall Field Conference is being organized by Margaret Anne Rogers and Barry Kues; it will tour the Jemez–Nacimiento Mountains area. In 1997 we will visit the Four Corners region under the skillful guidance of Spencer Lucas and Orin Anderson. Please contact these conference chairpersons if you can make a contribution to their field conference or their guidebook.

Old timers know, and new students quickly learn, that we collectively carry the life blood of the Society, and sustain it. Two old timers and honorary members of the Society, Russ Clemons and Sherman Wengerd, both recently deceased, will be sorely missed this year. Young earth science professionals may be decreasing in number but hopefully not in loyalty to their Society. If this is your shoe, fill it (with pride) and continue the support of what I think is the best regional geological society in the United States. Enjoy the geology and camaraderie; it has been my pleasure to serve you and your Society.

Richard M. Chamberlin

EDITORS' MESSAGE

The geology and scenery of the Santa Fe area are as diverse and stimulating as anywhere in the state, and yet, in 45 years the New Mexico Geological Society has staged only a single field conference here, in 1979. Rather than being a condemnation of Santa Fe, however, we view this instead as a testament to the great size and varied geology of New Mexico, as well as to the membership's willingness to explore all corners of the state. We also believe that it's time for a revisit, in part because of the spectacular scenery, but also because of the tremendous recent advances in understanding Earth processes and the history of north-central New Mexico.

The 1956 Fall Field Conference, which toured from Santa Fe to Las Vegas on a route very similar to our Day 2 trip, was guided by a roadlog written by the USGS trio Elmer Baltz, Alexander Wanek and Charlie Read. After following their log, it became clear to us that they and their colleagues had many of the important aspects of the geology figured out 40 years ago. Fortunately for us, in geology there is always room for improvement, and so, in spite of the prowess of these pioneers, this guidebook is packed with new, exciting, and, in some cases, provocative research. We feel especially fortunate to have the paper by Shari Kelley and Chuck Chapin on the tectonic evolution of the southern Sangre de Cristo Mountains. The authors have integrated a variety of data sets, including state-of-the-art fission-track work, into a thought-provoking model for this important area.

The most dramatic shift in earth science investigation since the 1979 trip has resulted from the need for more information concerning the impact of human activities on natural resources and the environment. This trend is reflected in our guidebook by the variety of contributions on hydrogeology, mine and mill remediation and reclamation, environmental geology, and engineering geology. In Santa Fe County, the availability, quantity, and quality of potable water is now a major focus of research and debate. In the Ortiz Mountains and along the upper Pecos River, at sites we will visit on this trip, major efforts are being directed towards evaluating the past and future environmental effects of mining. In many areas within the Rio Grande rift, human-induced ground subsidence results in severe economic impacts. And the list goes on. We hope that the information published in this easily accessible guidebook will assist interested geoscientists as well as the concerned public.

As always, much of the success of our annual guidebooks has depended on a dedicated and competent pool of volunteers. We gratefully acknowledge the contributions of the many authors and road-loggers, and the time donated by all of our NMGS patrons. Special thanks to Chuck Chapin, State Geologist and Director of the New Mexico Bureau of Mines and Mineral Resources, for generously assisting with personnel, vehicles, and drafting. Several of our road log stops this year are special treats not generally available to the public. Our visits to the Tiffany mine and the Allan Houser gallery were thoughtfully arranged by Ed Smith of Tesuque. Our tour of the inactive and not-yet-active gold mines in the Ortiz Mountains was arranged by Steve Maynard, formerly of LAC Minerals, Inc. Others who assisted—many of whom are repeat offenders—include Louann Jordan of Santa Fe, whose sketches have graced guidebooks for many years, Jim Olsen who helped with logistics, Lynne Hemenway and Terry Telles who typed much of the book, and Peggy Johnson who provided road logging support and unofficial editorial advice. Others who aren't listed on the "Committee" page, but who should be recognized include Adobe Factory owner Mel Medina, Ghost Ranch personnel, Tiffany mine owner Douglas Mangus, Richard Lantz of the Houser Foundation, and assorted personnel from LAC Minerals.

The 1979 NMGS Guidebook also marked the first appearance-in-print of a young Princeton geology graduate named Jeff Grambling. In that guidebook, Jeff published an evocative summary of his recently completed Ph.D. research on the Precambrian geology of the Truchas Peaks area, launching a highly successful professional career in higher education, New Mexico geology, and the NMGS. Between 1979 and his premature death in 1993, Jeff become an officer in the NMGS, President in 1984, and a contributor of numerous guidebook papers and road logs. It is only fitting that this guidebook is dedicated to the memory and achievements of Jeff Grambling.

Paul W. Bauer, Barry S. Kues, Nelia W. Dunbar, Karl E. Karlstrom, Bruce Harrison

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1995
FIELD CONFERENCE SCHEDULE

Wednesday, September 27—Registration Day

4:00-8:00 p.m.	Registration at High Mesa Inn, Cerrillos Rd., Santa Fe.
5:30-8:00 p.m.	Icebreaker and exhibits at High Mesa Inn, Santa Fe.

Thursday, September 28—First Day

7:30 a.m.	Buses depart from High Mesa Inn, Santa Fe for tour northward.
12:00 noon	Lunch provided.
5:00 p.m.	Arrive at Ghost Ranch for tour and barbecue.
8:30 p.m.	Return to High Mesa Inn, Santa Fe.

Friday, September 29—Second Day

7:30 a.m.	Buses depart from High Mesa Inn, Santa Fe for tour eastward.
12:00 noon	Lunch provided.
5:30 p.m.	Return to High Mesa Inn, Santa Fe.
6:30 p.m.	Banquet at High Mesa Inn, Santa Fe.
7:30 p.m.	Speaker: Dr. Marc Simmons, Historian.

Saturday, September 30—Third Day

7:30 a.m.	Caravan departs from High Mesa Inn, Santa Fe.
12:00 noon	Lunch provided.
3:00 p.m.	Field conference ends at Ortiz Mountains.

CREDITS

Front Cover: Low altitude aerial photograph of Buckman Crossing on Rio Grande, with view eastward of southern Espanola Basin and southern Sangre de Cristo Mountains; Photography and flying by the late Paul Logsdon, Santa Fe. Color separation by Southwest Electronic Prepress Services, Albuquerque.

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