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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 1981 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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West Elk Breccia volcaniclastic facies in amphitheatre on north side of Mill Creek Canyon, West Elk volcanic field. Courtesy D. L. Gaskill, U.S. Geological Survey.

“The hills west of Ohio Creek are composed mainly of breccia . . . eroded in the most fantastic fashion. The breccia is stratified, and there are huge castle-like forms, abrupt walls, spires, and towers.”

A. C. Peale, Hayden Survey, 1876



New Mexico Geological Society
Thirty-Second Field Conference
October 8-10, 1981





Western Slope Colorado

Western Colorado and Eastern Utah

Editors

RUDY C. EPIS and
JONATHAN F. CALLENDER

Managing Editor

JONATHAN F. CALLENDER

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PRESIDENT'S MESSAGE

Once again, welcome to the annual field conference of the New Mexico Geological Society. This is the thirty-second consecutive, annual field conference sponsored by the Society. Each Fall this minor miracle springs from the efforts of an all volunteer force. Don Baars, Rudy Epis, Jack Campbell and Bill Chenoweth have sacrificed time and sanity so that the Society and its guests can enjoy the "geology and the good times" so intimately mixed in each field conference.

This year's guidebook is different from those of the past, in that the Society has not solicited any external financial support either in the form of advertising or as contributions from individuals and corporations. The Society continues to maintain a high scientific standard in which all contributions are carefully reviewed. I extend the special thanks of the Society to Jon Callender. Jon has not only served as the President, Vice-President and Secretary of the Society, but he also has been an author, editor or managing editor for seven guidebooks since 1974. As the Managing Editor for this guidebook, he has been at the focus of the pressure and panic of producing the final product that you hold in your hands.

Enjoy the Field Conference and make your plans to join us next year in Albuquerque Country.

Rod Ewing
President

EDITORS' MESSAGE

Since the days of the Hayden Survey more than a century ago, the part of Colorado west of the continental divide generally has been referred to as the western slope. Together with adjoining parts of eastern Utah and southwestern Wyoming, the western slope of Colorado long has been known to contain vast deposits of uranium, vanadium, coal, oil and gas, and oil shale. Equally well-known and documented in the literature are base and precious metal deposits related to volcanic and sub-volcanic environments of Laramide and middle to late Tertiary age. During the past decade, significant geological effort has been focused on Precambrian volcanogenic metallic deposits of the Gunnison uplift and on Tertiary molybdenum deposits north of the Gunnison River. Likewise, encouraging assessments of the geothermal resources of the western slope of Colorado have been completed. Clearly, in the perspective of present-day and predictable national and international scenarios, the western slope of Colorado and neighboring segments of the Rocky Mountain West are destined for major, commercial exploration and production of metallic and non-metallic resources. Already in the news are forecasts of small, western slope communities with populations of less than a few hundred mushrooming to over 25,000 people, together with new cities of similar or larger size, within the next 10 to 20 years.

Most of the papers in this volume address the general or local geological framework of known or anticipated economic deposits as outlined above. However, the western mountainous slope of Colorado and adjacent province of plateaus and canyons of eastern Utah, which merge imperceptibly, are endowed with some of the most spectacular physiography and scenery in the nation. They are the result of repeated tectonic uplift and volcanism, and attendant erosion by the Colorado River and its major tributaries such as the Gunnison, Uncompahgre, Dolores and San Miguel Rivers, including of course, the renowned abandoned river valley of Unaweep Canyon atop the Uncompahgre Plateau, and the Black Canyon of the Gunnison River National Monument. The several papers in the geomorphology section of this volume are intended to decipher and explain the impressive landscapes we will enjoy during the field conference.

It is a pleasure to express our sincere appreciation to each author and co-author of articles and roadlogs in this volume. As every editor of such a volume knows, there could be no guidebook without the dedication of time and effort by individual contributors. We thank you all.

Although partly acknowledged in the credits for this book, we also wish to express our special thanks to the following individuals who supplied extra illustrative materials used throughout the volume: D. L. Baars, W. L. Chenoweth, C. P. Epis, D. L. Gaskill, W. R. Hansen, C. W. Keighin, S. W. Lohman, C. M. Molenaar, J. D. Moore, and S. Sinnock.

Rudy C. Epis
Jonathan F. Callender

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1981

FIELD CONFERENCE SCHEDULE

WEDNESDAY, October 7

3:00–9:00 p.m.

6:00–9:00 p.m.

REGISTRATION DAY

Registration: Grand Mesa Room, Holiday Inn, Grand Junction, Colorado

Cocktail party (cash bar)

THURSDAY, October 8

6:30–7:00 a.m.

FIRST DAY

Board chartered buses in parking lot of Holiday Inn for tour of Uncompahgre Uplift, the fold and fault belt of the Paradox basin, via Unaweep Canyon, and Arches National Park. **(Bring your own lunch.)**

FRIDAY, October 9

7:30–8:00 a.m.

SECOND DAY

Board chartered buses in parking lot of Holiday Inn for tour of stratigraphy and structure of west-central Colorado as seen from I-70 between Grand Junction and the east end of Glenwood Canyon, and presentation at Paraho Oil Shale Demonstration Plant. **(Bring your own lunch.)**

6:30–7:30 p.m.

Cocktail party (cash bar), Holiday Inn.

7:30–9:30 p.m.

Prime rib banquet with surprise speaker, Holiday Inn.

SATURDAY, October 10

6:30–7:00 a.m.

THIRD DAY

Assembly of auto caravan at Holiday Inn, Grand Junction. **Please follow directions of flagmen.** Conference will follow U.S. Highway 50 to Gunnison and then tour the Crested Butte region north of Gunnison. Featured will be the mining activity of the Crested Butte area, a side trip to the Black Canyon of the Gunnison, and spectacular scenery. Conference will end at about 5:00 p.m. at Gunnison, Colorado. **(Bring your own lunch.)**

CREDITS

Front Cover: Black Canyon of the Gunnison; pen and ink drawing by Charlene P. Epis.

End Sheets: (Front) Geologic map of Grand Valley, F. D. Owen, Hayden Survey, 1876, courtesy W. L. Chenoweth; (Back, left) Looking northeast from Fruita Canyon at west entrance of Colorado National Monument toward Grand Valley, Book Cliffs (dark), and Roan Cliffs (light), courtesy S. W. Lohman; (Back, right) The Narrows of the Black Canyon of the Gunnison (width at river 12 m; depth 530 m; width at rim 350 m), courtesy W. R. Hansen.

Frontispiece: West Elk breccia volcanoclastic facies in Mill Creek Canyon, courtesy D. L. Gaskill.

Title Page: Mount Garfield, in Book Cliffs on northeastern side of Grand Valley; infrared photograph courtesy of S. W. Lohman.

Ink Drawings: P. Chenoweth, C. P. Epis, J. D. Moore.

Photography: D. L. Baars, W. L. Chenoweth, R. C. Epis, D. L. Gaskill, C. S. Goodknight, W. R. Hansen, C. W. Keighin, K. Lee, S. W. Lohman, C. M. Molenaar, S. Sinnock, R. J. Weimer.

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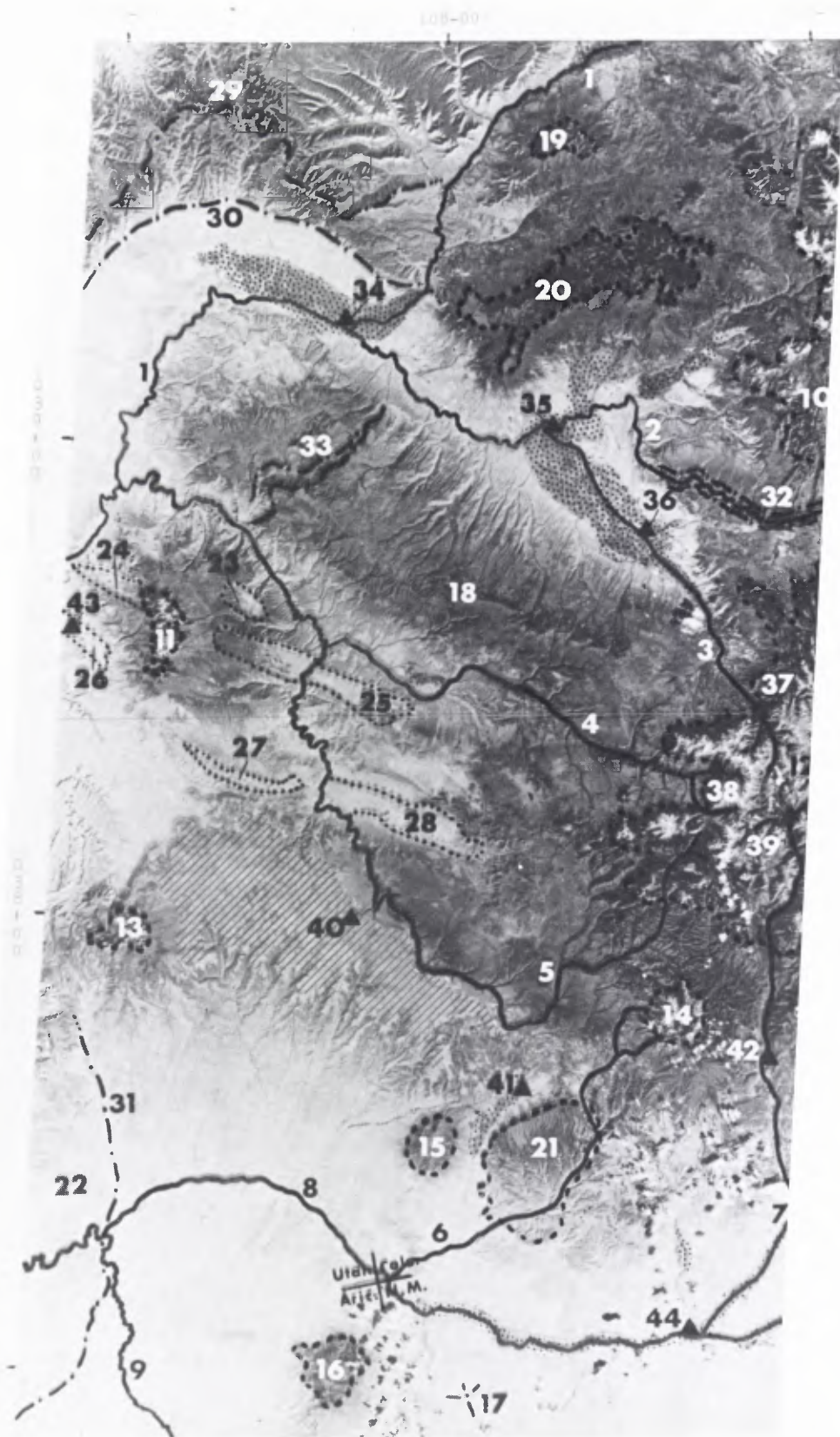
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- STOPS**
- ◇ First day
 - ◼ Second day
 - Third day
- REGIONAL FEATURES AND ROUTES OF TRAVEL**
- The map illustrates the Grand Canyon National Monument and its surrounding regions. Key features include the Colorado River, Grand Valley, and various mesas and plateaus. The map also shows several travel routes and stops, numbered 1 through 7. The legend indicates that stops are marked with symbols: a diamond for the first day, a square for the second day, and a circle for the third day. The map includes a scale bar and a compass rose.

STOPS

- ◇ First day
- ◆ Second day
- Third day

REGIONAL FEATURES AND ROUTES OF TRAVEL

The map illustrates the Grand Canyon National Monument and its surrounding regions. Key features include the Colorado River, Grand Valley, and various mesas and plateaus. The map also shows several travel routes and stops, numbered 1 through 7. The legend indicates that stops are marked with diamonds for the first day, solid diamonds for the second day, and solid circles for the third day. The scale bar and compass rose provide a reference for distance and orientation.



RIVERS

- 1—Colorado River
- 2—Gunnison River
- 3—Uncompahgre River
- 4—San Miguel River
- 5—Dolores River
- 6—Mancos River
- 7—Animas River
- 8—San Juan River
- 9—Chinle Creek

MOUNTAINS

- 10—West Elk Mountains
- 11—La Sal Mountains (laccolith)
- 12—San Juan Mountains
- 13—Abajo Mountains (laccolith)
- 14—La Plata Mountains (laccolith)
- 15—El Late (Ute) Mountains (laccolith)
- 16—Carrizo Mountains (laccolith)
- 17—Shiprock (volcanic neck)

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- 18—Uncompahgre Plateau
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- 20—Grand Mesa (volcanic flow)
- 21—Mesa Verde
- 22—Monument Uplift

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- 24—Castle Valley (anticline)
- 25—Paradox Valley (anticlinal graben)
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- 32—Black Canyon of the Gunnison
- 33—Unaweap Canyon (abandoned Colorado River channel)

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 - 35—Delta (Delta Co.)
 - 36—Montrose (Montrose Co.)
 - 37—Ouray (Ouray Co.)
 - 38—Telluride (San Miguel Co.)
 - 39—Silverton (San Juan Co.)
 - 40—Dove Creek (Dolores Co.)
 - 41—Cortez (Montezuma Co.)
 - 42—Durango (La Plata Co.)
- Outside Colorado
- 43—Moab, Utah
 - 44—Farmington, New Mexico

LAND USE

- ▨▨▨▨ Crop Land
 ///// Pasture Land

LANDSAT photograph of southwestern Colorado and southwestern Utah showing most of the localities to be visited on the field conference. Courtesy of Scott Sinnock, Sandia National Laboratories.