Front Matter

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

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GUIDEBOOK

of the

Tyrone Big Hatchet Mountains

Florida Mountains Region

EDITOR
Lee A. Woodward

NEW MEXICO GEOLOGICAL SOCIETY

TWENTY-FIRST FIELD CONFERENCE—October 29, 30, and 31, 1970

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PRESIDENT'S MESSAGE

WELCOME to the New Mexico Geological Society's Twenty-first Annual Field Conference. Enjoy yourselves!

The success of this conference is clue to the gratuitous efforts of many people to whom we owe a big THANKS!

This conference is one of the 'outcrop' trips as suggested by Fred Trauger in his presidential message in 1966. We will have an opportunity to put our hands on rocks and structures.

Dr. Edward Teller, in commenting on secrecy in nuclear research, has said, in part: "A quarter-century of experience should have taught us that a democracy cannot function effectively under a cloak of secrecy; that secrecy impedes the flow and exchange of knowledge and dampens the productivity of scientific research.

Ever since alchemy expired, which was not so very long ago, openness was the first commandment of science. It came even before truth because without openness, truth cannot be found."

The science of geology will expand if openness is the policy. We hope these field conferences contribute to that openness.

Edward E. Kinney

ROBERT A. ZELLER, JR. A MEMORIAL

On March 6, 1970, Bob Zeller, flying alone in his Cessna 172 Skylark, crashed in eastern Arizona. He died as independently as he lived. Bob was born in Ketchikan, Alaska, where his father worked for the U.S. Forest Service. Bob was single, Presbyterian, spoke Spanish fluently, and was one of the most able geologists ever to live and work in the State of New Mexico. He was graduated from high school in June, 1943, attended Penn State where he received his B.S. in Geology in January, 1948, and his M.S. in Geology in January, 1949. In August, 1958, after years of work in the Big Hatchet Mountains and surrounding areas of southwestern New Mexico, southeastern Arizona, and northern Mexico, he was awarded the Ph.D. in Geology at the University of California, Los Angeles. Bob was an Army veteran, having served in the Infantry and with the Corps of Engineers between August 1944 and June 1946. Bob was also a fellow of the Geological Society of America, a member of AAAS and of Sigma Gamma Epsilon.

I became well acquainted with this able young man while he was an Instructor in Geology at the University of New Mexico during 1950-51; from 1951 to 1958 he was geologist for the New Mexico Bureau of Mines and Mineral Resources, after which he ranged widely through the American southwest, Mexico, Peru, Bolivia, Argentina, and Chile as a consultant. Bob kept Ins headquarters in Hachita, New Mexico, in sight of his beloved Big Hatchet Mountains, the subject of his Ph.D. dissertation. During 1958 and 1959 we worked together on the geology of the Lower Diamond A Ranch lands in Hidalgo County, New Mexico, and the Little Boquillas Ranch in Cochise County, Arizona, for the Kern County Land Company of San Francisco.

The range of Bob's professional activities has involved work for Federal and state governments, oil companies, mining companies, and universities. Notable experience includes detailed geologic mapping of complex areas, reconnaissance mapping of large regions, exploration for metallic and nonmetallic mineral deposits, stratigraphic studies important to oil and gas exploration, and instructing geology students in the field and classroom. University courses he taught included field geology, structural geology, engineering geology, historical geology, and physical geology.

His rollicking laugh, rolling his own cigarettes with both hands (Bull Durham sack hanging out of his mouth), and his unassuming technique of field cookery (a can of beans, one spoon, later to use the can as a cooking pot or a wash basin!) were all simple-looking marks of a complex man. Bob loved nature and often expressed his notion that there were too many people and they despoiled too readily their environment. This state, the southwest, this country, and this hemisphere will miss Bob Zeller for a very long time.

Sherman A. Wengerd

Author's *note:* This memorial was prepared from my own personal experiences, Robert A. Zeller Jr. career briefs assembled by himself, and data supplied by Frank Kottlowski of Socorro and by R. D. Caldwell of Midland, Texas.

MEMORIAL TO HARRISON A. SCHMITT

Harrison A. Schmitt was born on June 11, 1896 at Mankato, Minnesota and died suddenly on October 26, 1966. He attended the University of Minnesota, studied under Emmons, and received an A.B. degree in 1921, an M.E. in 1922, and a Ph.D. in 1926. His doctoral dissertation was on the Parral mining district in Chihuahua and Durango, Mexico.

After spending a few years in Mexico he moved to Silver City, New Mexico and made that his home for the remainder of his life. He was married in 1929 to Miss Ethel Hagan. They raised a family of two girls, Mrs. R. E. Decker and Miss Armena Schmitt, and a son, Dr. H. H. Schmitt who is a geologist and an astronaut.

Dr. H. A. Schmitt was one of the most distinguished mining geologists in the southwestern part of the United States and specialized in the thorough study of ore bodies rather than mining districts and mineralized regions. He was an excellent field geologist and much of his success can be attributed to the months and, in some cases, years that he put in on field problems.

Dr. Schmitt was a very kind and thoughtful person and always was happy to help others, especially students.

Harrison Schmitt was a charter member of the New Mexico Geological Society and was elected an Honorary Member in 1947. He was also the fourth President of the Society.

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PUBLICATIONS OF THE NEW MEXICO GEOLOGICAL SOCIETY

FIELD CONFERENCE GUIDEBOOKS

* Out of Print

*1. San Juan Basin [covering the north and the east sides], New Mexico and Colorado, 1950, Vincent C. Kelley, ed., 152 p., 40 illus.

*2. South and west sides of the San Juan Basin, New Mexico and Arizona, 1951, Clay T. Smith and Caswell Silver, eds., 163 p., 71 illus.

*3. Rio Grande country, central New Mexico, 1952, Ross B. Johnson and Charles B. Read, eds., 126 p., 50 illus.

4. Southwestern New Mexico, 1953, Frank E. Kottlowski, ed., 153 p., 70 illus. $3.00

5. Southeastern New Mexico, 1954, T. F. Stipp, ed., 209 p., 76 illus. $3.00

*6. South-central New Mexico, 1955, J. Paul Fitzsimmons, 193 p., 66 illus. Prepared with the cooperation of the Roswell Geological Society.

7. Southeastern Sangre de Cristo Mountains, New Mexico, 1956, A. Rosenzweig, ed., 151 p., 61 illus. . .$4.00

8. Southwestern San Juan Mountains, Colorado, 1957, Frank E. Kottlowski and Brewster Baldwin, eds., 258 p., 110 illus. $4.00

9. Black Mesa Basin [northeastern Arizona], 1958, Roger Y. Anderson and John W. Harshbarger, eds., 205 p., 106 illus. Prepared in cooperation with the Arizona Geological Society. $5.00

10. \Vest-central New Mexico, 1959, James E. Weir, Jr., and Elmer H. Baltz, eds., 162 p., 91 illus. $5.00

11. Rio Chama country [New Mexico and Colorado] 1960, Edward C. Beaumont and Charles B. Read, eds., 129 p., 35 illus. $5.00

12. Albuquerque country [New Mexico], 1961, Stuart A. Northrop, ed., 199 p., 83 illus $6.00

13. Mogollon Rim region [east-central Arizona], 1962, Robert H. Weber and H. Wesley Peirce, eds., 175 p., 77 illus. Prepared in cooperation with the Arizona Geological Society. $7.00

14. Socorro region [New Mexico], 1963, Frederick J. Kuellmer, ed., 240 p., 90 illus. $7.00

15. Ruidoso country [New Mexico], 1964, Sidney R. Ash and Leon V. Davis, eds., 195 p., 64 illus. $7.00

16. Southwestern New Mexico II, 1965, J. Paul Fitzsimmons and Christina Lochman Balk, eds., 244 p., 73 illus. $7.50

17. Taos-Raton-Spanish Peaks country [New Mexico and Colorado], 1966, Stuart A. Northrop and Charles B. Read, eds., 128 p., 40 illus. $7.50

18. Defiance-Zuni-Mt. Taylor region [Arizona and New Mexico], 1967, Fred Trauger, cd, 228 p., 98 illus. $9.00

19. San Juan-San Miguel-La Plata Region [New Mexico and Colorado], 1968, John Shomaker, ed. $9.00

20. The Border Region [Chihuahua and the United States], 1969, Cordoba, Wengerd, Shomaker, eds. $13.50

21. Tyrone-Big Hatchet Mountains-Florida Mountains Region [New Mexico], 1970, Woodward, ed. . .$12.50

SPECIAL PUBLICATIONS

1. Bibliography and index of the New Mexico Geological Society Guidebooks, 1950-63; compiled by Sidney R. Ash. $0.75

2. A history of the New Mexico Geological Society; by Stuart A. Northrop.

3. The San Andres Limestone: a reservoir for oil, gas and water . . . [a symposium]; **F. E.** Kottlowski and W. K. Summers, eds. $3.00

MAPS

a. Geologic highway map of New Mexico, in color, 23x29 in.; compiled by Frank E. Kottlowski and others. ..... $1.00 folded; $1.25 rolled

b. Geologic map of the Sierra County Region, compiled by Vincent C. Kelley; in Guidebook 6. ..... $0.50

c. Geologic map of the Rio Chama country; compiled by Clay T. Smith and William R. Muehlberger, in Guidebook 11. ..... $0.50

d. Geologic map of the Albuquerque country; compiled by Stuart A. Northrop and Arlette Hill; in Guidebook 12. ..... $0.50

e. Tectonic map of the Ruidoso-Carrizozo region compiled by V. C. Kelley and Tommy B. Thompson; in Guidebook 15. ..... $0.75

f. Tectonic map of the Defiance-Zuni-Mt. Taylor region; compiled by V. C. Kelley; in Guidebook 18 ..... $1.50

All publications are available by mail (please add 25 cents for postage and handling each guidebook) from, or over the counter, at the New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico. Guidebooks, and the geologic highway maps are available over the counter at the Dept. of Geology, Univ. of N. Mex., Albuquerque; Holmans, Albuquerque; Roswell Map Service, Roswell; and the Museum of Northern Arizona, Flagstaff, Arizona.

Checks should be made payable to the New Mexico Geological Society.

SCHEDULE OF CONFERENCE

Wednesday, October 28, 1970—Registration Day

1:00-10:00 P.M.	Registration in lobby of Ramada Inn, Deming, New Mexico.

Thursday, October 29, 1970—First *Day Field* Trip

8:00 A.M.	Buses depart from Ramada Inn for Silver City and Tyrone.
	Lunch stop—Scott Park, Silver City.
7:30 P.M.	Banquet at LULAC Hall, Deming, Dr. Harrison H. Schmitt, NASA, Speaker

Friday, October 30, 1970—Sccond *Day Field* Trip

7:30 A.M.	Buses depart from Ramada Inn for Big Hatchet Mountain area and Winkler anticline.
	Lunch stop—Stop 5—Winkler anticline.

Saturday, October 31, 1970—Third Day Field Trip

7:30 A.M.	Buses depart from Ramada Inn for Florida Mountains.
1:30 P.M.	End of Twenty-first Field Conference.

INTRODUCTION

by

LEE A. WOODWARD

The University of New Mexico

This field conference marks the third time that the New Mexico Geological Society has gathered in southwestern New Mexico. Although the last field conference was held in 1965 there arc sufficient new developments of geological interest to make the current field conference significant to all segments of the profession. In contrast to the broad, regional aspects of the earlier field conferences held in this region, this excursion concerns detailed examination of the outcrops.

Southwestern New Mexico is geologically complex and the geologic features include a wide variety, ranging from the crystalline basement to the volcano-tectonic elements of the Mogollon country. We have attempted to reflect this immense variety in the articles in the Guidebook with everything from unusual contact metamorphism to carbonate petrology. At the same time there has been an effort to maintain balance between papers on applied geology and those of mainly scientific interest, between "hard-rock" and "soft-rock," and between mining and petroleum interest. In the overview of the geology of the region all of these various aspects are significant; our goal has been to provide a perspective, including the controversies, of this complex and fascinating area.

Our field conference centers about Deming and each day's excursion leads in a different direction, like spokes radiating from a hub. A map of the route and the stops is found on the end pages of the Guidebook. Also, an additional roadlog for the southern end of the Florida Mountains has been included; the buses used for the conference cannot traverse this extra route, but those using the Guidebook in future years can follow this route with a pickup or jeep.

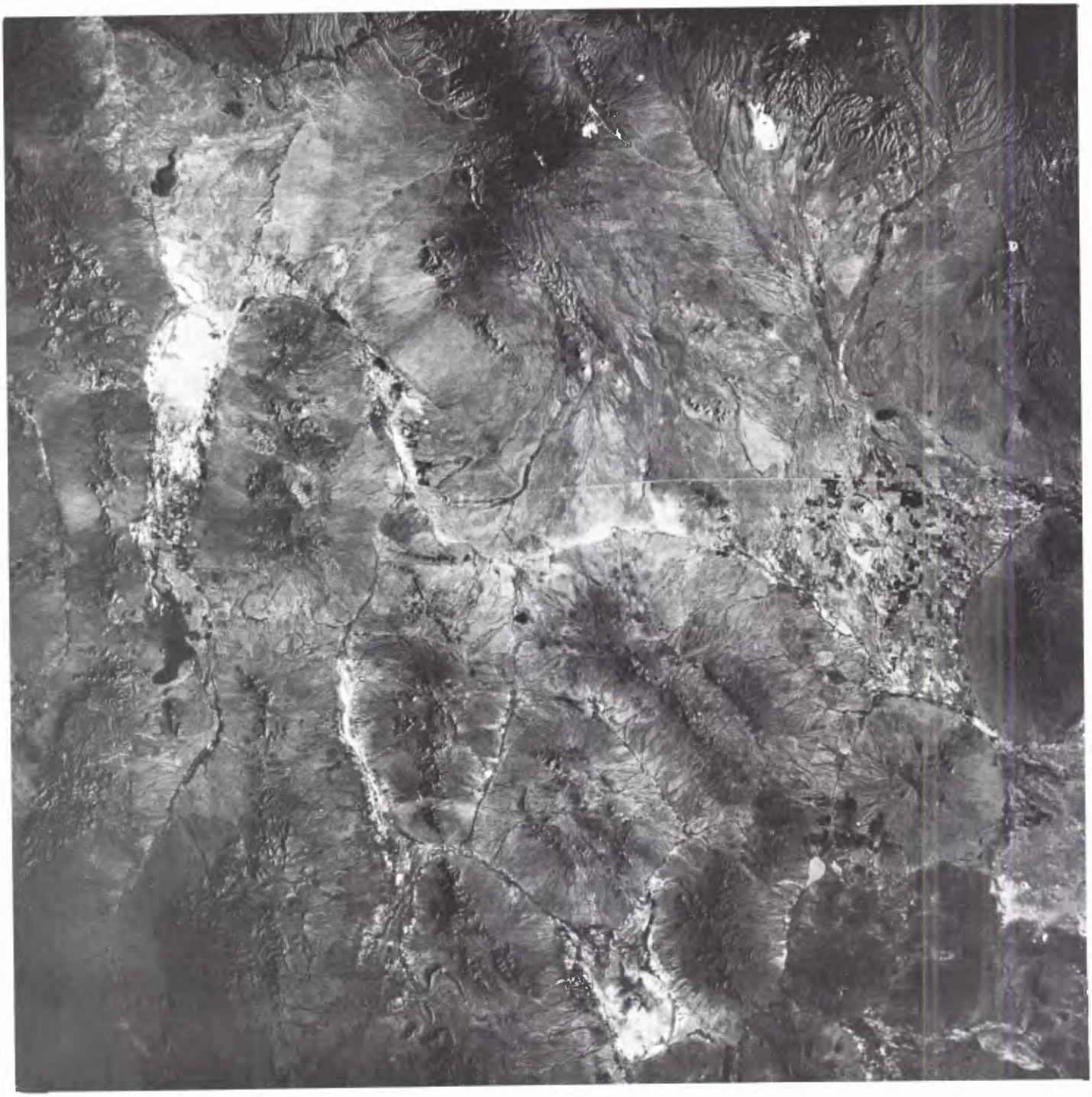
The first day is concerned mainly with ore deposits and the shelf section of strata seen near Silver City to the northwest. On the second day we will see the basinal stratigraphy and the foldbelt and Basin-Range structures of the Big Hatchet Mountains area to the southwest. The third day involves a short, half-day trip to the Florida Mountains southeast of Deming where a lower Paleozoic section is seen and where complex imbricate thrust slices occur along thecontact of the Cordilleran foldbelt and the cratonic foreland.

A lexicon of stratigraphic names used in southwestern New Mexico by Christina Lochman-Balk is available in the 1965 New Mexico Geological Society Guidebook to Southwestern New Mexico II (p. 93-111) and therefore is not included in this Guidebook. Also, in view of the fact that stratigraphic nomenclature charts were not included in the earlier Guidebooks of this region a nomenclature chart is found immediately following this introduction.

As editor of this Guidebook I would like to take the opportunity to express my gratitude to all who have contributed so generously of their time, effort, and knowledge. The authors of all the articles came through in excellent form to facilitate editing the Guidebook. Perhaps it should be noted that after the untimely death of Robert A. Zeller, Jr., who was to have led the trip through the Big Hatchet area, Ed Kinney, president of the Society, and Will Baltosser, general chairman, took it upon themselves to see that the Big Hatchet trip would be included in the field conference. This involved their leading the trip themselves; in addition to their regular duties as officials of the New Mexico Geological Society, they found themselves compiling roadlogs. As if this were not enough, Ed Kinney also prepared the condensation of Robert A. Zeller's New Mexico Bureau of Mines and Mineral Resources Memoir 16 concerning the stratigraphy of the Big Hatchet Mountains.

As always, Frank Kottlowski of the New Mexico Bureau of Mines and Mineral Resources helped in many ways, including securing articles for the Guidebook. Harold James of the New Mexico Highway Department again provided many excellent photographs. Tom Lyons and Warren Oates of the Technology Application Center of the University of New Mexico kindly prepared the material for the space photograph of southwestern New Mexico.

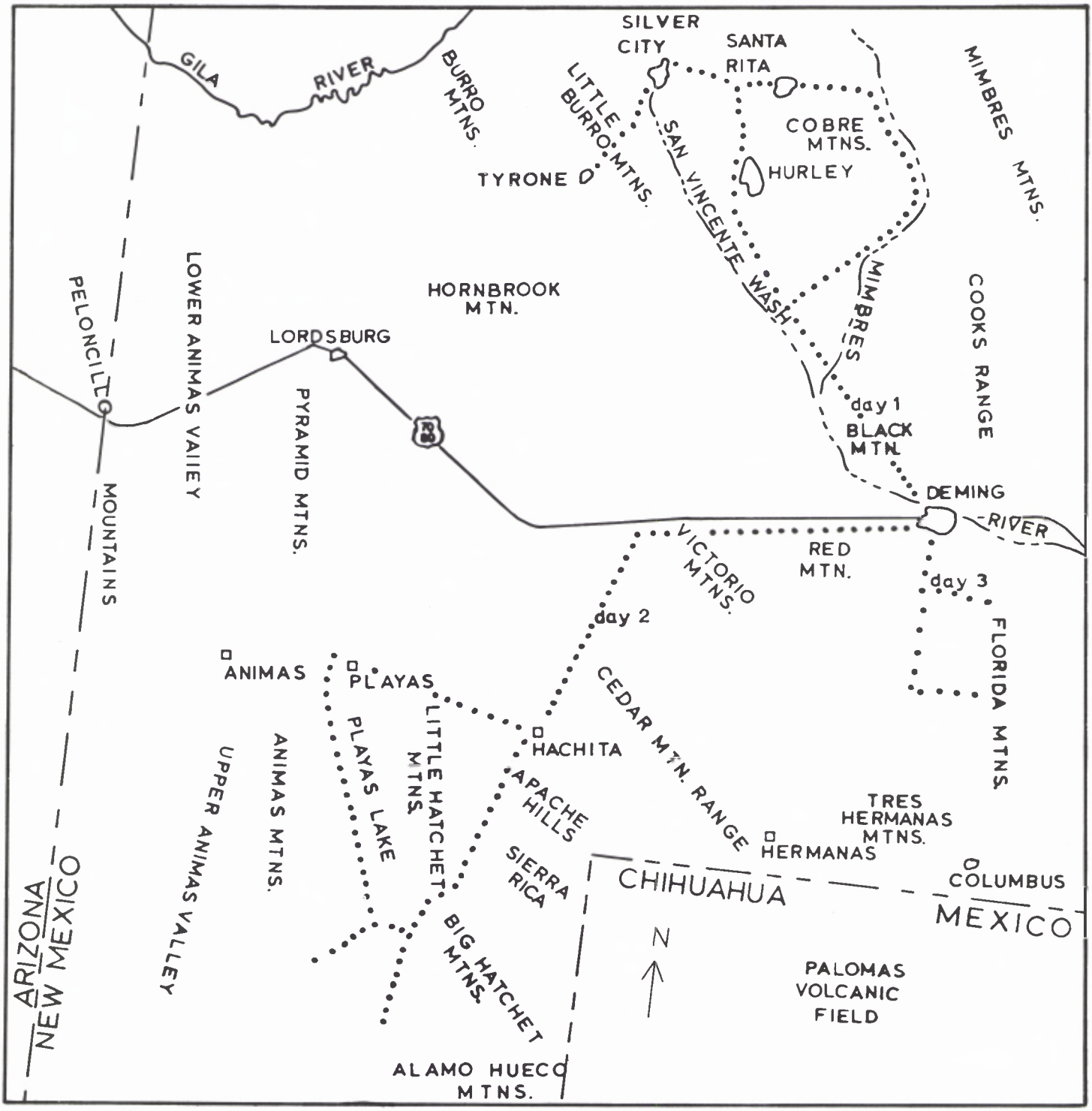
A warm, resounding welcome to all participants in the field conference is in order. We hope that each and every one of you will contribute to the success of the field conference—a good, healthy argument on the outcrop is beneficial to all of us! Above all we hope that the conference and Guidebook will be stimulating.



Apollo VI Unmanned spacecraft photograph of portions of southwest New Mexico, southeast Arizona and northern Chihuahua, Mexico. This photograph was taken with a Maurer camera, Model 220G using Kodak, Ektachrome, High Resolution Aerial, SO121 film. The date of the overflight of Apollo VI was April 4, 1968. The photograph is one of a series taken in stereo-overlap across the southern portion of the United States.

Approximate scale: 1″ = 12.5 miles

To order copies of this and other NASA base photographs contact the Technology Application Center, University of New Mexico, Albuquerque, New Mexico 87106.



Place name and trip route identification map for Apollo VI photograph on opposite page.

Approximate scale: 1″ = 12.5 miles