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PREVIEW

**GEOLOGY AND PETROLOGY OF THE CHISPA
MOUNTAIN QUADRANGLE AND VICINITY,
CULBERSON AND JEFF DAVIS COUNTIES, TEXAS**

BY

LEWIS WILLIAM TEAL

PREVIEW

Geology and Petrology of the Chispa Mountains Quadrangle
and Vicinity, Culberson and Jeff Davis Counties, Texas.

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Geology and Petrology of the Chispa Mountain Quadrangle
and Vicinity, Culberson and Jeff Davis Counties, Texas.

by

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Thesis

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ABSTRACT

The Chispa Mountain area is located 18 miles (32 km) southeast of Van Horn, Texas, astride the boundary of Culberson and Jeff Davis Counties. Tertiary volcanic rocks form a series of rolling hills and cuestas which surround a central peak, Chispa Mountain. The volcanic rocks occur as part of a larger north-south trending linear horst, referred to as the Wylie Mountain uplift, and form an intermediate zone between the Davis Mountains and Sierra Vieja volcanic centers.

Ten chronostratigraphic volcanic units, referred to as the Garren Group, were recognized on the basis of field mapping and petrography. Potassium-argon age dates of the Garren Group range from $33.3 \pm .7$ m.y. to 38.6 m.y. indicating that volcanism began in upper Eocene and continued through lower Oligocene. Whole rock chemical analysis suggests that volcanic activity occurred in four major cycles.

The area occurs near the eastern margin of the Basin and Range province in Trans-Pecos, Texas. Evidence indicates that Lobo Valley, which flanks the Wylie Mountains uplift to the west, is an eastern extension of the Rio Grande Rift. Deformation within the volcanics is limited to regional southwestward homoclinal tilting and minor faulting. Morphologic, structural, and stratigraphic evidence suggest that the Wylie Mountain uplift forms a resurgent caldera. Development of the caldera involved six major stages which culminated with it being dissected by Basin and Range tectonism.

TABLE OF CONTENTS

	Page
Acknowledgements	ii
Abstract.	iii
Table of Contents	iv
List of Tables.	vii
List of Figures	vii
List of Plates.	viii
Introduction.	1
Location and Access.	1
Physiography	1
Vegetation and Climate	3
Previous Work.	3
Procedure and Purpose.	4
Geologic Setting.	5
Stratigraphy.	7
Introduction	7
Hogeye Tuff.	7
Pantera Ignimbrite	12
Garren Mt. Tuff Breccia.	15
Buck Mt. Tuff.	18
Water Tuff	21
Lower Member	21

	Page
Upper Member	25
Means Latite	25
Crosby Tuff.	28
Bonito Latite.	29
Fairbury Tuff.	33
Bell Valley Andesite	35
Geochemistry.	40
Analytical Procedure	40
Whole Rock Geochemistry.	41
Trace Element Geochemistry	46
Structure	49
Regional Structure	49
Regional Igneous Petrology.	52
Petrogenesis.	54
Relationship to the Rio Grande Rift	55
Local Structure.	57
Faults.	59
Other Faults.	60
Folds	60
Summary	61
Caldera Evidence	62
Structural Evidence.	62
Faults.	62

	Page
Tilting	63
Intrusion	63
Unconformity.	63
Stratigraphic Evidence	64
Outcrop Patterns.	64
Source Areas.	64
Morphological Evidence	64
Historical Geology.	65
Introduction	65
Historical Development of the Wylie Mountains Caldera. . .	65
Basin and Range Tectonism	68
Conclusions	70
References Cited.	72
Vita.	75

LIST OF TABLES

	Page
Table I. Original and revised stratigraphic columns of the Garren Group, with arrows showing equivalent units.	8
Table II. Sample localities for whole-rock analysis	40
Table III. Whole-rock geochemical analysis of the Garren Group.	42
Table IV. Th/U ratio for the Garren Group	47

LIST OF FIGURES

Figure 1. General physiography of Trans-Pecos, Texas.	2
Figure 2. Plot of alumina versus alkalis for the Garren Group.	43
Figure 3. Magmatic zones of Trans-Pecos, Texas.	44
Figure 4. Eruptive cycles of the Garren Group	45
Figure 5. Tectonic map of Trans-Pecos, Texas.	51
Figure 6. Tectonic map of the southern Rio Grande Rift, including possible extensions (from Seager <u>et al.</u> , 1979, p. 3).	56

LIST OF PLATES

	Page
Plate I. Geologic map of the Chispa Mountain Quadrangle.	in pocket
Plate II. Cross sections of the Chispa Mountain Quadrangle.	in pocket
Plate III. Structural map of the Wylie Mountains Uplift.	in pocket
Plate IV. Hogeye Tuff: Devitrified matrix with altered phenocrysts	11
Plate V. Hogeye Tuff: Scanning electron photomicrograph of glass shards	11
Plate VI. Pantera Ignimbrite: Vent on N. face of Pantera Peak.	14
Plate VII. Pantera Ignimbrite: Sanidine and augite phenocrysts in a devitrified crystalline matrix.	14
Plate VIII. Garren Mt. Tuff Breccia: Outcrop	17
Plate IX. Garren Mt. Tuff Breccia: Photomicrograph showing boundary between matrix and scoria fragment	17
Plate X. Contact between Buck Mt. Tuff and Garren Mt. Tuff Breccia.	20
Plate XI. Buck Mt. Tuff: Serrated phenocrysts of andesine with overgrowth rim of albite.	20
Plate XII. Water Tuff, Lower Member: Contact between the basal vitrophyre and the densely welded zone	23
Plate XIII. Water Tuff, Lower Member: Glass shards draped over a phenocryst of anorthoclase.	23
Plate XIV. Water Tuff, Lower Member: Pumice fragment draped over a phenocryst of anorthoclase.	24

	Page
Plate XV. Means Latite: Feldspar phenocrysts in a matrix of skeletal hematite crystals	27
Plate XVI. Crosby Tuff: Devitrified pumice fragment draped over sanidine crystal	30
Plate XVII. Crosby Tuff: Electron scanning photomicrograph of twinned feldspar crystal draped by glass shards.	30
Plate XVIII. Bonito Latite: Vent	32
Plate XIX. Bonito Latite: Photomicrograph of oligoclase, orthoclase and magnetite.	32
Plate XX. Fairbury Tuff: Cobble size lithic fragment of Means Latite in the Fairbury Tuff. . . .	34
Plate XXI. Fairbury Tuff: Vent	34
Plate XXII. Fairbury Tuff: Undistorted glass shards	36
Plate XXIII. Bell Valley Andesite: Phenocryst of hypersthene altered to maghemite.	38

INTRODUCTION

Location and Access

The Chispa Mountain area is located 18 miles (32 km) southeast of Van Horn, Texas astride the boundary of Culberson and Jeff Davis Counties. The area of study is composed entirely of Tertiary volcanic rocks and occurs in the 7.5 minute U.S.G.S. Chispa Mountain Quadrangle (Fig. 1).

In general, the study area is reached by U.S. Highway 90 south from Van Horn, Texas. The northern and central parts are accessible from the first entrance on the eastern side of U.S. 90 south of G-G Farms, about 16 miles southeast of Van Horn. The southern part is reached from the C.C. Means ranch road, about 22 miles (40 km) southeast of Van Horn. All roads in the quadrangle are unpaved, but are regularly maintained. While most roads are accessible by automobile, a two-wheel drive pick-up truck is recommended.

Physiography

The volcanic rocks occur at the southern end of a north-trending horst. This uplift includes the Wylie Mountains to the north. It is bounded on the west by Lobo Valley and on the east by Michigan Flat. The area consists of a series of rolling hills and cuerdas that surround a central peak, Chispa Mountain. It forms the highest point in the area 4800 ft (1333 m) above sea level, some 1200 ft (333 m) above the bolson fill.

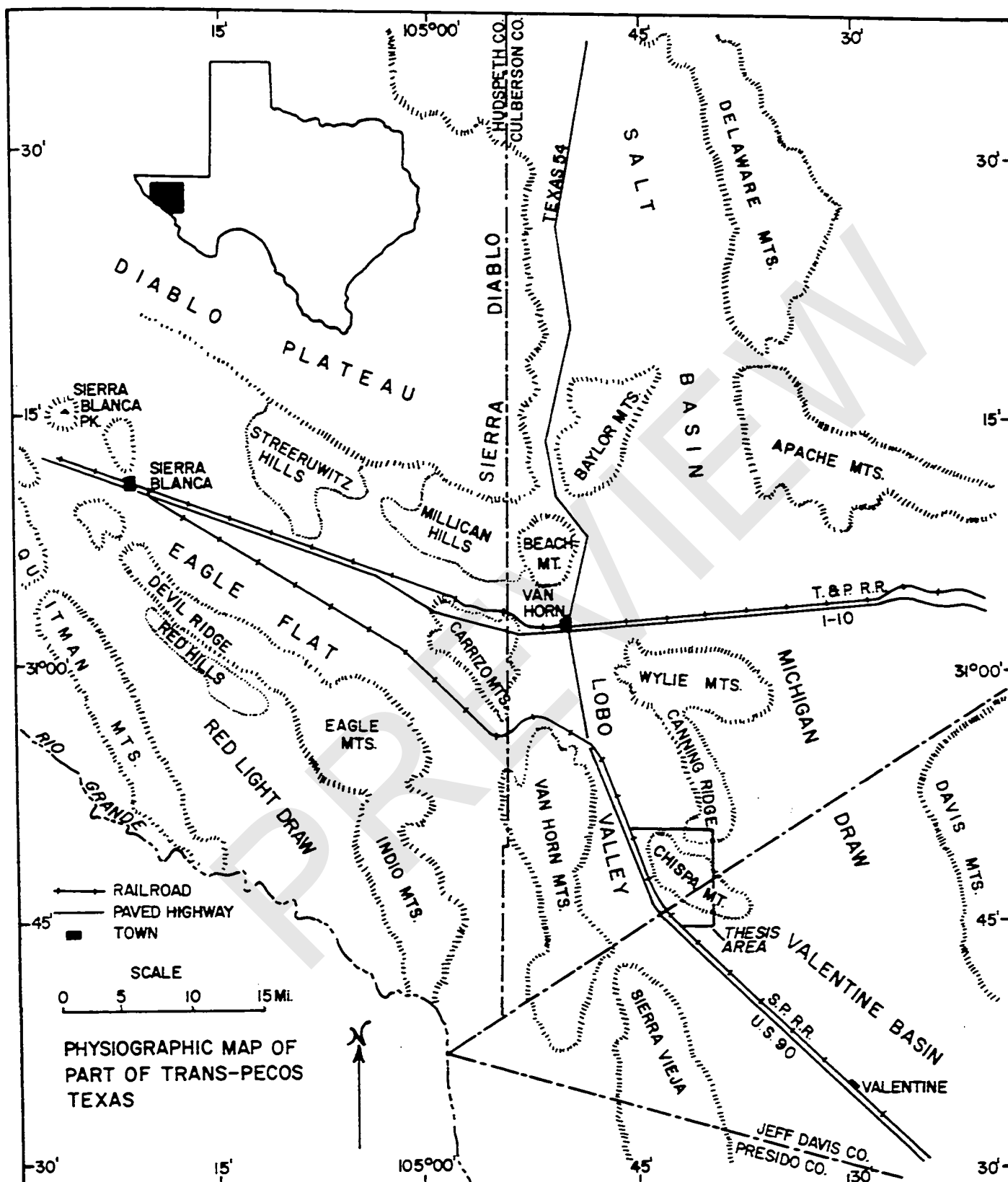


Figure 1. General physiography, Trans-Pecos, Texas from Wylie (1970).

Vegetation and Climate

The area is located within the Chihuahua Desert. Slopes are covered with prairie grass and yucca cactus. Mesquite bush, prickly pear, lechugilla, and barrel cacti are confined to arroyos and well drained slopes. Creosote bush flourished within the bolson flats.

Average summer temperatures frequently exceed 100°F (38°C); winter daytime temperatures are seldom less than 32°F (0°C). The average yearly precipitation is 11 inches (28 cm). Most of this is confined to July and August in the form of torrential thunderstorms.

Previous Work

Von Streeruwitz (1889) published the first account of the area during the course of his preliminary geologic investigation of the Trans-Pecos area for the Dumble Survey. C. L. Baker (1929) published a reconnaissance map of the area in which he made a general subdivision of the Tertiary volcanic rocks.

In the early 1950's, graduate students from the University of Texas at Austin, mapped parts of the area for thesis projects. Woodward (1954) mapped around Chispa Mountain and areas to the south. R. B. Wightman (1954) studied the geology of the Valentine area.

The most comprehensive field work on the area was performed by Hay-Roe (1957, 1958). Working for the Texas Bureau of Economic Geology, he mapped the Wylie Mountains proper and the volcanic rocks to the south.

Purpose and Procedure

The thesis problem was first proposed in the Spring of 1978 by Dr. Jerry M. Hoffer. The purpose of the study was to: 1) differentiate the volcanic rock units into individual flow units where possible; 2) locate possible source area(s) for the volcanic rocks; and 3) determine if the area was an eruptive center.

The Chispa Mt. Quadrangle was mapped in the summer of 1978 on corrected aerial photographs at a scale of 1:31,250. During the fall of 1978 eight columnar sections were measured and approximately 135 samples were collected from all exposed units.

Thin sections were prepared for petrographic study. Chemical whole rock analysis for ten major oxides was performed on an Ortec TEFA Model 6110. Trace element analysis for uranium, thorium, and potassium were performed on a Nuclear Data Pulse Analyzer. A micro-textures study was performed on an Ion Equipment Corporation scanning electron microscope.

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GEOLOGIC SETTING

Tertiary volcanic rocks of the Chispa Mountain area are considered to be the northwestern extension of the Davis Mountains volcanic field (Hay-Roe, 1958). They occur as part of a larger north-south trending linear horst, referred to by Hay-Roe (1958), as the Wylie Mountains uplift. To the immediate north, and in contact with the volcanic rocks, are uplifted Precambrian metamorphic rocks and Permian and Cretaceous marine strata that form the Wylie Mountains.

Structurally, the Wylie Mountains form the highest point of the uplift. Precambrian strata attain an elevation of some 4800 ft (1333 m) above sea level. Immediately south of the thesis area, in the Valentine Basin, Cretaceous strata lie beneath some 5000 ft (1667 m) of Cenozoic volcanic rocks (Hay-Roe, 1958).

The uplift occurs as an intermediate expression within a larger structural depression. The Salt Basin forms a large graben lying to the north of the central uplift. Its southwestern extension, Lobo Valley, continues southeastward about 25 mi (45 km). Lobo Valley is flanked to the northeast by the Wylie Mountains uplift, and to the southwest by the Van Horn Mountains and the Sierra Vieja.

Michigan Flat flanks the Wylie Mountains uplift to the east. The Davis Mountains lie approximately 20 mi (36 km) to the east. Although the volcanic units of the Chispa Mountain area are considered genetically related to the Davis Mountains volcanic field, they more

probably form an intermediate zone between the Davis Mountains and Sierra Vieja volcanic centers (Hay-Roe, 1958).

PREVIEW

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