ABSTRACTS OF RECENT THESES IN ARIZONA AND WESTERN NEW MEXICO

By

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Green, Thomas E., Jr.: M.S., U. of Texas; Disturbed beds near St. Johns, Apache County, Arizona

The folded and contorted siltstone beds of a disturbed zone about 60 feet thick within the lower part of the Upper Triassic Chinle formation, enclosed both above and below by undisturbed strata, are exposed in an area of approximately 2 square miles. This unusual feature appears to be due to a subaqueous and subaerial landslide on the edge of an ancient delta in a large interior lake basin during lower Chinle time. Overloading of sediment initiated a gradual slide on bentonitic material as a glide plane now marked by a discordant interface. Toward the front of the slide the folds are overturned and highly contorted, with probable thrust faulting; migration of plastic sediments thickened and thinned the strata. Toward the rear the folds are simple and open. Subaqueous erosion beveled the folds. Continuing deposition of Chinle sediments buried the folding, preserved it, and erected a second discordant interface above the disturbed zone.

Marr, Ronald J.: M.S., U. of Texas; Geology of Lynch Ranches Catron and Valencia Counties, New Mexico

On the Lynch ranches, 23 miles east of St. Johns, Arizona, a sequence of rocks was mapped including Upper Triassic Chinle shale; Upper Cretaceous strata of Dakota, Mancos, and Mesaverde formations, which are essentially horizontal, dipping about 1° to the north, except for a broad, shallow, northwest-trending syncline which is probably a result of Laramide deformation; and late Cenozoic deposits, including a high-level Tertiary-Quaternary gravel which is described as the Fence Lake gravel, and the late Pleistocene Richville formation (names not formally proposed). Available well data record a Precambrian basement unconfomably overlain by rocks of Permian age. The Lower Triassic Moenkopi formation, as well as those of the Jurassic system and perhaps the Lower Cretaceous series, pinch out near the borders of the area.

O'Brien, Bob R.: M.S., U. of Texas; Geology of Cienega Amarilla Area, Catron County, New Mexico and Apache County, Arizona

The first detailed geologic map of a 120-square-mile area on the Arizona-New Mexico border east of St. Johns, Arizona, in Catron County, New Mexico, shows the following outcrops: the Triassic Chinle formation divided into three members by a middle thick, persistent sandstone member; the Cretaceous Dakota sandstone, Mancos shale, Mesaverde formation, and possibly the Eagar arkose, which could lie partially or wholly in the Tertiary; and the Quaternary Richville formation, two basalt flows, different gravel and landslide deposits, travertine, and alluvium. In the subsurface resting on the Precambrian are the Permian Abo redbeds, Yeso formation, Coconino sandstone, and San Andres limestone in ascending order. The regional northerly 1° dip reverses to 3° southeasterly in the southern part of the area.

Rehkemper, Leonard James: M.S., U. of Texas; Petrology of Springerville area, Apache County, Arizona

In the Springerville area, both the Eagar formation of Cretaceous and/or Tertiary age and the Datil formation, probably middle to late Tertiary, are continental deposits, the Eagar an arkose, the Datil a volcanic arkose. In the field the Datil-Eagar contact and, in most places, the Eagar-Mesaverde contact seemed to be gradational, but thin-section study has revealed breaks in sedimentation. The Eagar received its materials from the underlying Mesaverde formation and from outcrops of sedimentary rocks and igneous intrusions in the Mogollon geanticline southwest of Springerville. The Datil also received all its sediments from the south, in part by erosion of flowrock, of the Eagar, and of the older formations of the Mogollon geanticline, and in part directly from outbursts of pyroclastic material.

During the deposition of the Eagar the climate was humid, during the Datil deposition, arid.

Petrographically, the Quaternary basalts are not separable.

Robertson, Roland S.: M.S., U. of Texas; Chinle Stratigraphy of St. Johns Vicinity, Apache County, Arizona

The detailed map of a 90-square-mile area shows about 18 square miles of outcrop of the Upper Triassic Chinle shale; in the rest of the area the Chinle is covered by Quaternary deposits only. The Chinle comprises a 400-700 foot sequence of lenticularly bedded conglomerate, sandstone, mudstone, bentonitic claystone, and non-marine cherty limestone. During the Upper Triassic epoch southwester, southern, and southeastern source areas furnished igneous, metamorphic, volcanic, and sedimentary terrigenous materials to the Chinle basin of deposition. Exposures of 130-200 feet of penecontemporaneously folded beds approximately 40 feet above the base of the formation occupy an area of more than two square miles.

Rutledge, Floyd Wayne: M.S., U. of Texas; Cenozoic History of Springerville Area, Apache County, Arizona

The consolidated sedimentary rocks in the Springerville area are related to the Laramide orogeny and to widespread vulcanism during the middle Tertiary. The topography of the area is chiefly the result of late Pleistocene Richville formation, a few miles north of the area, to an overlying basalt layer which can be traced into the Springerville area.

Sirrine, G. Keith: Ph.D., U. of Texas; Geology of the Springerville-St. Johns Area, Apache County, Arizona

A detailed map of approximately 1,000 square miles on the southern margin of the Colorado Plateau shows outcrops of sedimentary strata of Permian, Triassic, Cretaceous, Tertiary, and Quaternary age. The Eager (Upper Cretaceous-Paleocene) and Richville (late Pleistocene) formations and the Summers member of the Mesaverde sandstone (Upper Cretaceous) are named. Quaternary basalt, plus several cinder cones, covers much of the southwestern part of the area. At least five stages of extrusion took place. Extensive travertine deposits ranging in age from late Pleistocene to Recent occur in more than 100 square miles of the north-central part of the area. The simple structure is mostly homoclinal, interrupted in places by predominantly northwest-trending, late Laramide anticlines and synclines. Three anticlines are eroded to expose San Andres limestone (Permian); a fourth contains the southernmost outcrop of Chinle (Triassic) on its crest. Six late-Pleistocene erosion surfaces and five different gravels are recognized.

Smith, Harry L.: M.S., U. of Texas; Cretaceous Stratigraphy of Carrizo Drainage Basin, Apache County, Arizona, and Catron and Valencia Counties, New Mexico

In the extreme southern part of the Colorado Plateau the Carrizo drainage system has exposed some 750 feet of Upper Cretaceous rocks. The Dakota sandstone, which rests on Triassic beds, is considered to be the basal formation of the Upper Cretaceous series and to become progressively younger to the southwest. The Mesaverde formation and the Mancos shale are intertonguing formations above the Dakota. In the south part of the Carrizo drainage basin a previously undescribed tongue of Mesaverde is present, resulting in a thinner section of Mancos than heretofore measured. Pre-Eagar erosion reduced the thickness of the Mesaverde, which perhaps exceeded 2,000 feet. Some evidence points to a Cretaceous age for the Eagar formation in the southern part of the basin; other, to substantiate a Tertiary age.

Underwood, James R., Jr.: M.S., U. of Texas; Geology of Carrizo Valley, Southern Apache County, Arizona

A detailed geologic map of a 195-square-mile area in eastern Carrizo Valley

shows outcrops of Upper Triassic Chinle shale, Upper Cretaceous Dakota sandstone, Mancos shale, and Mesaverde sandstone, late Pleistocene Richville formation, and younger Quaternary deposits of basalt, travertine, terrace gravels, and alluvium. Notably absent are Jurassic and Lower Cretaceous, and possibly Lower Triassic rocks. In the subsurface above the Precambrian basement are the Permian Abo redbeds, Yeso redbeds, Coconino sandstone, and San Andres limestone.

Carrizo Valley is synclinal. The ancestral late Pliocene or early Pleistocene drainage was filled to a depth of several hundred feet by the late Pleistocene Richville deposits. The ancestral valley has been subsequently exhumed.

Woodyard, Kenneth E.: M.S., U. of Texas; Clays of St. John's Vicinity, Arizona and New Mexico

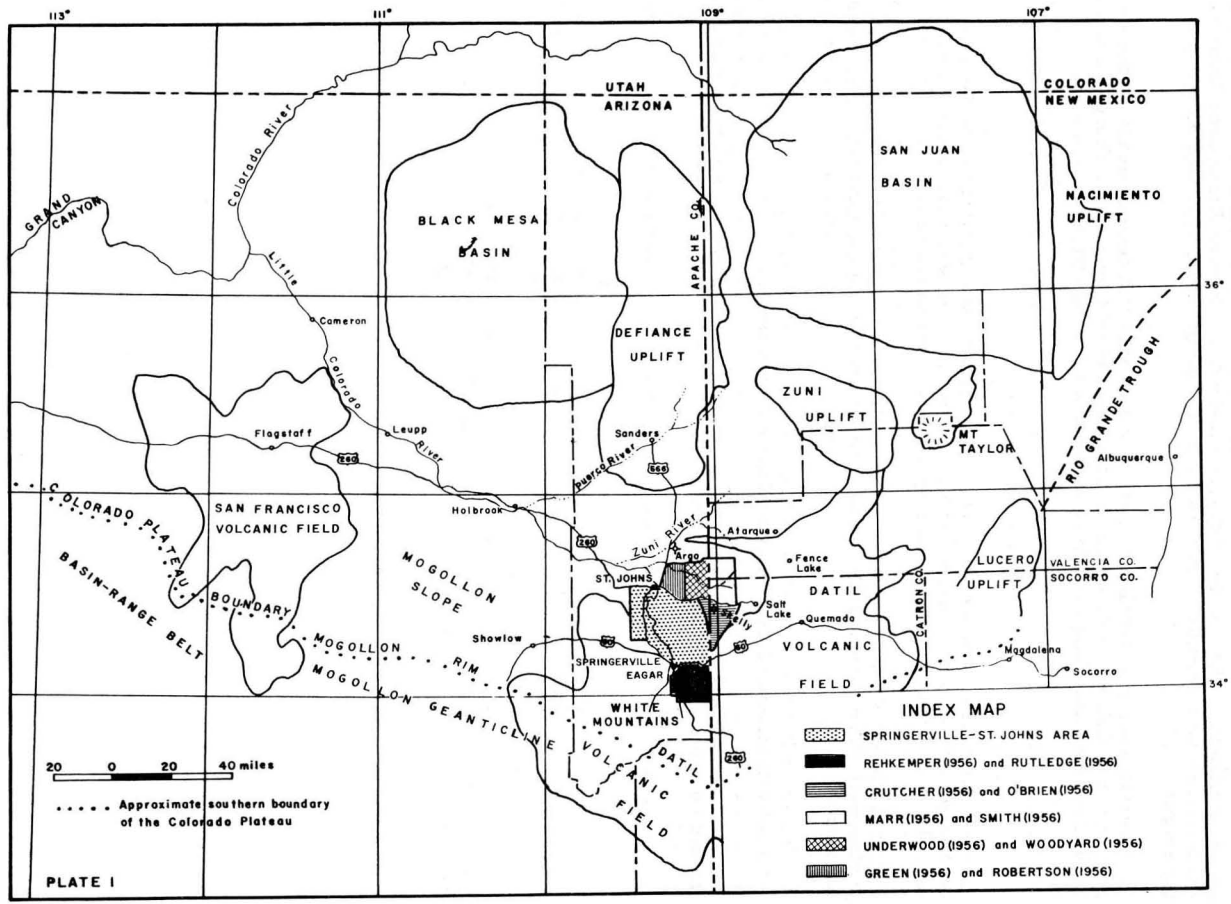
Clay minerals from the Triassic, Cretaceous, and Quaternary systems, studied by X-ray, microscopic, and differential thermal methods, include kaolinite, montmorillonite, illite, chlorite, and interlayered mixtures of these.

There was continuous deposition of kaolinite throughout Triassic time and during part of the Cretaceous. Kaolinite reappeared in the Quaternary Richville formation.

Montmorillonite, indicative of previous volcanic activity, is the man clay-mineral constituent of the Triassic Chinle formation.

The transgressive-regressive character of the Cretaceous sediments is reflected by their clay-mineral content.

The sources of the Richville formation were the rocks that still crop out in the area.


113°
111°
109°
107°
UTAH
ARIZONA
COLORADO
NEW MEXICO
SAN JUAN
BASIN
NACIMIENTO
UPLIFT
GRAND
CANYON
Colorado River
Little
Colorado
BLACK MESA
BASIN
APACHE CO.
Cameron
DEFIANCE
UPLIFT
36°
ZUNI
UPLIFT
MT
TAYLOR
RIO GRANDE TROUGH
Albuquerque
Flagstaff
Leupp
River
Sanders
Puerco River
COLORADO PLATEAU
SAN FRANCISCO
VOLCANIC FIELD
Holbrook
Zuni River
Atarque
Fence
Lake
LUCERO
UPLIFT
VALENCIA CO.
SOCORRO CO.
Argo
ST. JOHNS
DATIL
Salt
Lake
Quemado
CATRON CO.
BASIN-RANGE BELT
BOUNDARY
MOGOLLON
SLOPE
Showlow
MOGOLLON
RIM
VOLCANIC
FIELD
Magdalena
Socorro
SPRINGERVILLE
EAGAR
MOGOLLON GEANTICLINE
WHITE
MOUNTAINS
34°
DATIL
VOLCANIC
FIELD
20 0 20 40 miles
Approximate southern boundary
of the Colorado Plateau
PLATE I
INDEX MAP
SPRINGERVILLE-ST. JOHNS AREA
REHKEMPER (1956) and RUTLEDGE (1956)
CRUTCHER (1956) and O'BRIEN (1956)
MARR (1956) and SMITH (1956)
UNDERWOOD (1956) and WOODYARD (1956)
GREEN (1956) and ROBERTSON (1956)

MISCELLANEOUS NEWS

The Arizona Bureau of Mines has completed and issued geologic maps of seven of the fourteen counties in Arizona on six sheets at a scale of 1:375, 000. These are: Cochise, Graham-Greenlee, Maricopa, Mohave, Pinal, and Yavapai Counties. The next map to be issued, that of Gila County, is scheduled for release in December.

Compared with the 1924 Geologic Map of Arizona, the County Geologic Maps contain much additional detail, and more accurately delineate the geology because of more accurate base maps. More comprehensive separation of units has been made, especially of the volcanic rocks and of the Precambrian crystalline rocks.

Professor William F, Jenks of the University of Cincinnati, with a grant from the N. S. F., is engaged in a study, to last at least two years, of the late Cretaceous and Cenozoic volcanic rocks of southeastern Arizona. Initial mapping is being done in Pinal County between Superior and the Gila River. Work was begun during the summer of 1959 by Messrs. Donald C. Lamb, Harold Bohmer, and O. Dale Naegele, graduate students at the University of Cincinnati. A special objective of the project is to determine and compare the sequence of volcanic events in selected areas, and to establish their relationships to epeirogeny and, perhaps, to mineralization.

A. K. Armstrong, graduate student at the University of Cincinnati, is completing a dissertation on the stratigraphy, paleogeography, and paleontology of Mississippian formations in southwestern New Mexico and southeastern Arizona. He is working with sections in the Chiricahua Mountains, the Tombstone-Bisbee area, and the Peloncillo Mountains.

Dr. Leon T. Silver conducted a summer field camp for California Institute of Technology in the Little Dragoon Mountains this past summer. He is engaged in geochronological studies involving Precambrian and younger rocks in southeastern Arizona, especially those in the Dragoon quadrangle. These studies are designed not only to provide dates which will contribute to the regional picture, but also to present some geological tests to the dating techniques. Publication of some results may be expected shortly. He is planning to extend the studies to areas where correlations with the Dragoon quadrangle geology are suggested.