THE GEOLOGICAL SURVEY OF WYOMING
Gary B. Glass, State Geologist

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ONGOING STUDIES ON THE GEOLOGY OF WYOMING

by

Phillip L. Greer and Alan J. VerPloeg

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Introduction

This publication provides titles and brief descriptions of studies on Wyoming geology which are currently underway. Recently published articles are included in cases where they are related to an ongoing study.

The information in this report was obtained primarily from replies to a questionnaire that was sent to major colleges and universities and to other agencies involved in Wyoming geology.

Entries are arranged by state and by institutions within each state. In the subject index, all headings are arranged alphabetically.

Anyone wishing to include their ongoing projects is asked to submit pertinent information to the Geological Survey of Wyoming for inclusion in future renditions of this bibliography. Send information to the Geological Survey of Wyoming, Box 3008, University Station, Laramie, Wyoming 82071, or call (307) 742-2054 and ask for Alan VerPloeg.

California

Occidental College
Los Angeles, California 90041

1. Prothero, D.R., Emry, R., and Kron, D., Magnetostratigraphy of the Oligocene White River Group, eastern Wyoming: study in progress.

   For the past seven years, magnetostratigraphic studies of the mammal-bearing Oligocene White River Group in eastern Wyoming have been conducted. To date, the entire sequence has been correlated with Chrons C15r and C9 of the magnetic polarity timescale, and biostratigraphic events have been related to the global timescale by means of magnetostratigraphy. Some of these sequences have radiometric dates, which have proven important in calibrating the polarity timescale.

Prothero, D.R., 1985, Chadronian (early Oligocene) magnetostratigraphy of eastern Wyoming: implications for the age of the Eocene-Oligocene boundary: Journal of Geology, v. 93, p. 555-565.

Prothero, D.R., 1985, Mid-Oligocene extinction event in the North American land mammals: Science, v. 229, p. 55-551.

Pomona College
Claremont, California 91711

2. Zenger, D.H., Dolomitization in the Madison Limestone, Sinks Canyon, Wyoming: study in progress.

   Work to this point indicates that the lower half of the Madison in this area is predominately dolomite although there are many instances of vertical and lateral changes to limestone. An alternating sequence of massive, fossiliferous and resistant (cliff-forming) limestones and more recessive calcareous dolomites represents the upper part of the formation. Laboratory work is in a preliminary stage, and includes 50 thin sections, as well as, density, XRD and insoluble residue determinations.

San Francisco State University
San Francisco, California 94132

3. Sullivan, R., Origin of lacustrine rocks of the Green River Formation, Wyoming: study in progress.

   This project is a subsurface correlation of the early Tertiary stratigraphic units in the Green River Basin and adjacent regions. The purpose of the study is to incorporate a more detailed stratigraphic synthesis into the interpretation of the depositional environment of the Green River Formation.

Sullivan, R., 1985, Origin of lacustrine rocks of the Wilkins Peak Member, Wyoming: American Association of Petroleum Geologists Bulletin, v. 69, p. 913-922.

San Jose State University
San Jose, California 95192

4. Andersen, D.W., Baldwin, R.J., Helm, R.L., and Wray, M.J., Sedimentology of the Wasatch and Fort Union Formations on the south flank of the Rock Springs uplift: study in progress.

The stratigraphy and sedimentology of the Fort Union Formation and the main body of the Wasatch Formation are being investigated, with the aim of integrating tectonic and paleoclimatic controls on sedimentation. These fluvial deposits record low-gradient conditions within the Greater Green River Basin, and they comprise recognizable lobes of sediment contributed from four distinct sediment sources surrounding the basin.

Helm, R.L., 1985, Depositional history and petrology of the Fort Union Formation (Paleocene), southern flank of the Rock Springs uplift, Sweetwater County, Wyoming: M.S. thesis.

University of California
Berkeley, California 94720

5. Leopold, L.B., Hydraulics and sedimentology of braided rivers: study in progress.

Colorado
Colorado School of Mines
Golden, Colorado 80401

6. Geissman, J.W., and Coates, D.A., Paleomagnetism and rock magnetism of clinker deposits, Powder River Basin: study in progress.

Clinker deposits, consisting of baked and fused overburden formed during the *in situ* oxidation and burning of early Tertiary coals in the Quaternary, serve as a high fidelity recorder of the geomagnetic field. A thermoremanent magnetization (TRM), as well as superimposed chemical remnant magnetizations (CRM's), are acquired after burning. Quaternary behavior of the geomagnetic field (secular variation, reversal behavior, etc.) is being investigated.

Colorado State University
Fort Collins, Colorado 80523

7. Erslev, E.A., and Rogers, J., Foreland basement kinematics during the Laramide Orogeny: study in progress.

Detailed strain measurements on the rocks adjacent to the Forellen fault will be used to refine geologic models showing the evolution of basement-involved thrust-fold structures.

Erslev, E.A., 1986, Basement balancing of Rocky Mountain foreland uplifts: Geology, in press.

8. Erslev, E.A., Hildebrandt, P., Miller, S., and Reed, J.C., Jr., Precambrian evolution of the Teton gneiss complex: study in progress.

This research integrates mapping by John C. Reed, Jr. with detailed structural, metamorphic and geochemical studies of the Teton gneiss complex. The eventual goal is the delineation of the tectonic history of the complex and its relationship to the surrounding exposures of Archean rocks. Preliminary results include the definition of strong NNE stretching fabrics and the discovery of a widespread granulite facies event which preceded the amphibolite facies whose imprint dominates the range.

9. Hippe, D., Ethridge, F.G., and Needham, D., Depositional systems and petrology of the Mesaverde Formation, southeastern Wind River Basin, Wyoming: study in progress.

An outcrop and subsurface analysis of depositional systems, sandstone petrology and reservoir potential of the upper Cody Shale and Mesaverde Formation along the Rattlesnake Hills, Dutton Anticline and the adjacent subsurface. One fossil locality has been catalogued with the museum at the University of Wyoming. The Fales Sandstone, Parkman Sandstone and unnamed middle member are progradational wave-dominated strand-plain and deltaic complexes. The Teapot Sandstone is a braided-belt and meander belt deposit.

10. Moren, R.J., The depositional environment of the Pine Ridge Sandstone, northern Laramie Basin, Wyoming: M.S. thesis, in progress.

11. Needham, D.W., Hippe, D., and Ethridge, F.G., Depositional environments and diagenetic history of the Mesaverde Formation, southeastern Wind River Basin, Natrona County, Wyoming: study in progress.

This sedimentological/petrologic study concerns the Mesaverde Formation in the southeast arm of the Wind River Basin, Natrona County, Wyoming. The outcrops studied are along the southwest flank of the Casper Arch from Arminto to the North Platte River near Alcova Reservoir. The primary purposes of this study are to delineate facies, determine depositional environments and interpret the diagenetic history. The outcrop interpretations will be projected into the subsurface using electric logs and available core. At this time measured sections have been done and are being correlated with electric logs. The petrology is currently being done and will be supplemented with x-ray and SEM analysis.

University of Colorado
Boulder, Colorado 80304

12. Kraus, M.J., Sedimentology of early Tertiary rocks, Bighorn Basin, Wyoming: study in progress,

The major objectives of this study are twofold: (1) to determine the depositional processes which generated different types of sandstone bodies

in an early Tertiary alluvial sequence; and (2) to evaluate the utility of alluvial architecture models in unraveling the early Tertiary tectonic history of the northern Bighorn Basin. An integrated investigative approach, including facies analysis, study of paleosols and paleocurrent analysis is being followed. The alluvial sequence under study includes the upper part of the Paleocene Fort Union Formation and the lower part of the early Eocene Willwood Formation in the northern part of the Bighorn Basin.

The results obtained thus far illustrate the effects of slowed tectonic activity on the development of an alluvial sequence. Because other controls on alluvial architecture were also examined, the influence of tectonics can be evaluated with a degree of confidence not forthcoming from other field studies. This research also reveals that examination of lateral and vertical variability in paleosols is a promising new tool for analyzing alluvial sequences. Channel behavior, including the nature of avulsion and the relative abruptness of that process, as well as the probable direction of stream diversion can be deduced by examining vertical sequences of pedogenically modified overbank deposits. Furthermore, analysis of paleosols provides evidence for changes in relative rates of sediment accumulation that are controlled by both intrabasinal and extrabasinal factors, and which commonly cannot be obtained otherwise from alluvial sequences.

Kraus, M.J., 1985, Early Tertiary quartzite conglomerates of the Bighorn Basin and their significance for paleogeographic reconstruction of northwest Wyoming, *in* Flores, R.M., and Kaplan, S.S., editors, Cenozoic paleogeography of the west-central United States: Rocky Mountain Section SEPM, Special Publication, p. 71-91.

Kraus, M.J., 1985, Sedimentology of early Tertiary rocks, northern Bighorn Basin, *in* Flores, R.M., and Harvey, M., editors, Field guide to modern and ancient fluvial systems in the United States: Third International Fluvial Sedimentology Conference, Guidebook, p. 26-33.

Kraus, M.J., and Bown, T.M., 1986, Paleosols and time resolution in alluvial stratigraphy, *in* Wright, V.P., editor, Paleosols: their classification, recognition and significance, Princeton University Series in Geology: Oxford, Blackwell Scientific Publication, p. 180-207.

University of Denver
Denver, Colorado 80210

13. Toy, T.J., Sheetwash erosion and soil creep on natural and reclaimed hillslopes at the Glenrock Coal Company mine, Glenrock, Wyoming: study in progress.

This research was based upon sheetwash erosion and soil creep data collected over a five-year period at the Dave Johnston mine of the Glenrock Coal Company. Natural and reclaimed hillslopes were instrumented and data collected during three visits to the mine each year. There was little difference in sheetwash erosion or soil creep rates for the natural and reclaimed hillslopes. This indicates that reclamation has been successful in that each group of hillslopes appears to respond to environmental con-

ditions in similar fashion. The sample of sheetwash erosion measurements includes over 16,000 observations, making this perhaps the largest set of erosion data for any surface mine in the United States.

Soulliere, E., and Toy, T.J., 1986, Rilling of hillslopes reclaimed before the 1977 Surface Mining Law, Dave Johnston Mine, Wyoming: Earth surface processes and landforms, in press.

Connecticut
University of Connecticut
Storrs, Connecticut 06268

14. Geiser, P., Structural analysis in the Idaho-Wyoming thrust belt: study in progress.

The Idaho-Wyoming thrust belt is being used to test newly developed methodologies for prediction of subsurface geology in fold/thrust belts. The Preston 2° quadrangle was chosen because it is well mapped and has been extensively explored with seismic and well data. Consequently, the predicted three-dimensional structure can be compared with the known structure and this affords an excellent test of the methods used.

Georgia
Georgia State University
Atlanta, Georgia 30303

15. Fritz, W.J., Sedimentology of early Tertiary rocks in Yellowstone park: study in progress.

This ongoing research in Yellowstone involves the sedimentology and depositional environments of rocks burying the petrified forests. The current phase of the study is an examination of the orientations of clasts in mudflow units of the Lamar River and Sepulcher Formations in an attempt to determine the source peak that they came from. The author's previous work and that of Chadwick (1970) and the U.S. Geological Survey (Smedes and Prostka, 1972) have shown that numerous volcanic vents existed during Eocene time. This study attempts to determine the peak from which specific mudflow units came. This information will allow more accurate determination of the configuration of the depositional basin and the frequency of volcanic eruptions. Methods for this study have evolved from an examination of mudflows produced by recent eruptions of Mount St. Helens and Nevado del Ruiz in Columbia. Previous studies have assumed that clasts in volcanic mudflows are randomly oriented and of little use for determination of paleocurrents. However, oriented clasts in recent volcanic mudflows show a strong upcurrent imbrication like that in stream gravels making them suitable for paleocurrent studies.

Fritz, W.J., and Harrison, S., 1985, Early Tertiary volcaniclastic sedimentary rocks of the Northern Rocky Mountains, *in* Flores, R.M., and Kaplan, S.S., editors, Cenozoic paleogeography of the west-central United States: Rocky Moun-

tain Section SEPM Special Publication, p. 383-402.

Idaho
Idaho State University
Pocatello, Idaho 83209

16. Stoll, D., Neogene and Quaternary gravels in the canyon of the Snake River: M.S. thesis, in progress.

The purpose of the study is to document the periods of cutting and filling in the Grand Canyon. Cobble source, lithology and timing of filling episodes will be examined. Timing will be derived using K-Ar dates on tephra units. Levels of maximum infilling will be derived using altimeter measures of first occurrence of different lithologies.

University of Idaho
Moscow, Idaho 83843

17. Teel S., Depositional environment and petrography of the Ordovician Bighorn Dolomite, south-central Montana and northern Wyoming: M.S. thesis, in progress.

The objectives of this study are: 1. measurement of seven detailed stratigraphic sections, 2. description of sedimentary lithofacies and petrography, 3. discussion of depositional environment, 4. description of diagenetic features and the development of a paragenetic sequence and 5. discussion of an applicable model of dolomitization.

Illinois
Field Museum of Natural History
Chicago, Illinois 60605

18. Grande, L., Origin and evolution of the western North American fish fauna: study in progress.

Phylogenetic relationships and historical biogeography of the Cenozoic nonmarine fish fauna (particularly the teleosts) of western North America.

Grande, L., 1985, Fish fossils in the Eocene Green River Formation of southwestern Wyoming: National Geographic Research Reports, v. 21, p. 201-205.

University of Illinois
Urbana, Illinois 61801

19. Langenheim, R.L., Jr., Gierlowski, T.C., Weibel, C.P., Bieler, D., and Palmquist, J., Geologic mapping on the east flank of the northern Bighorn Mountains: study in progress.

Work is progressing on geologic maps of the following 7½-minute quadrangles: West Pass, Dayton North, Columbus Peak, Burgess Junction, Skull Ridge, Dayton South, Wolf, Walker Mountain, Beckton and Beaver Hills.

Indiana
Purdue University
West Lafayette, Indiana 47907

20. Loucks, R.R., McCallum, M.E., Glasscock, J., and Muntean, J.L., Petrology and structure of the Mullen Creek and Lake Owen gabbroic intrusions, Medicine Bow Mountains, Wyoming: study in progress.

Indiana University
Bloomington, Indiana 47405

21. Muffler, S., Jurassic - Cretaceous sedimentary tectonics in the Wyoming foreland: study in progress.

The study's chief goal is to interpret the effect of intraforeland - basin topographic highs on the provenance, dispersal and alluvial architecture of upper Jurassic/Lower Cretaceous sediment in the Wind River Basin. The preliminary results of our work suggest that an ancestral Beartooth structure may have had a significant effect on the nature of drainage in the northern Wind River Basin by early Cretaceous time.

Indiana University/Purdue University
Indianapolis, Indiana 46202

22. Hall R.D., Glacial history of the Wind River Range: study in progress.

The type areas of the Rocky Mountain glacial chronosequence in and near the Wind River Range are being examined as a basis for comparison and correlation with similar sequences studied in Montana, Colorado and New Mexico.

Iowa
University of Iowa
Iowa City, Iowa 52242

23. Ryan, M.P., Structural analysis of the Red Fork Powder River anticlines, Johnson County, Wyoming: M.S. thesis, in progress.

The subject of this thesis is several asymmetric anticlinal folds that trend northwest to southeast off the Bighorn Mountains. Orthophoto quadrangles were used to make a geologic map of the folds. Four cross-sections were made to show the character of the folds as they die out to the southeast. Field evidence and fracture orientations will be used to determine possible fold mechanisms.

University of Northern Iowa
Cedar Falls, Iowa 50614

24. DeNault, K.J., Fuchsite in the Granite Mountains, Wyoming: study in progress.

    This study involves detailed examination of the mineralogy of fuchsite discovered near Barlow Springs, Granite Mountains, Wyoming. The crystals have been compared with fuchsite found in cobbles at Clarkson Hills, Wyoming. The Barlow Spring locality may be the source for boulders at Clarkson Hill. The crystal chemistry of the fuchsite appears to be unusual in that both trioctahedral and dioctahedral layers are present.

25. DeNault, K.J., Evolution of the Tertiary igneous rocks in the Rattlesnake Hills, Wyoming: study in progress.

    The goal of this research is to determine the evolutionary trend of the Tertiary igneous rocks in the Rattlesnake Hills, Wyoming. Work to date has included detailed sampling and mapping of individual vents, computer modeling of petrographic trends, microprobe analysis of mineral phases and pressure-temperature calculations.

26. DeNault, K.J., Style of volcanism in the Leucite Hills, Wyoming: study in progress.

    This project is examining the eruptive style of volcanism in the Leucite Hills, Wyoming. The few published reports differ on their estimations of viscosity of erupted lavas and the nature of the eruptions themselves. Work includes detailed mapping of flows and vents and theoretical viscosity calculations based upon field criteria.

27. DeNault, K.J., Pressure-temperature conditions in the lower crust as deduced from xenoliths erupted in lavas of the Leucite Hills, Wyoming: study in progress.

    Pressure-temperature conditions in the lower crust are being calculated from data derived from lower crustal xenoliths erupted in lavas of the Leucite Hills, Wyoming. The work is sponsored in part by the National Science Foundation and microprobe data is being gathered using equipment of the Institute of Meteoritics, University of New Mexico. Progress to date includes a detailed collection of xenoliths and over 1,000 microprobe analyses.

Louisiana
Louisiana State University
Baton Rouge, Louisiana 70803

28. Nummedal, D., and Tillman, R.W., Shelf sandstone facies of the Shannon Sandstone: study in progress.

    The study involves identification and characterization of shelf sandstone facies of the Shannon Sandstone in the areas of the Haystack Mountains and the Salt Creek anticline.

University of Southwest Louisiana
Lafayette, Louisiana 70504

29. Tucker, D.R., and Birdseye, R., Structural reinterpretation of Five Springs area: study in progress.

This study is a structural reinterpretation of the west flank of the Bighorn mountains in the vicinity of the Five Springs Creek area. Specifically, the contact between the uplifted Precambrian basement core and the deformed features in the Paleozoic-Mesozoic cover that resulted from the uplift are being examined. Reconnaissance has indicated that some important modifications of the commonly accepted structural interpretation need to be made.

Massachusetts
North Adams State College
North Adams, Massachusetts 01247

30. Combs, H.L., Jr., Land reclamation following strip mining for coal: an evaluation: study in progress.

Through an examination of pre-surface mining landscapes, post-mining reclaimed surfaces, discussions with mine operators and correspondence with state agencies, an attempt was made to evaluate the effectiveness of land reclamation following surface mining for coal in the High Plains of the western states generally, and the Powder River Basin, specifically. Recognizing that although a century or so of time will provide a more acceptable response, if present and improving techniques are maintained, the semiarid high plains will suffer little (if any) permanent surface damage insofar as future land use and/or geomorphic processes are concerned.

University of Massachusetts
Amherst, Massachusetts 01003

31. Allison, M.L., Structural analysis of the Tensleep Fault, Bighorn Basin, Wyoming: PhD dissertation, in progress.

The study includes more than 12,000 measurements of mesoscopic structural data, a 1:24,000 geologic map, two 1:48,000 structure contour maps and a 1:48,000 isochore map. The data indicates dominantly reverse motion on the fault with minor left slip. The paleostress field is consistent with Farallon - North American plate collision during the Laramide orogeny, with possible late - Laramide reorientation of compression to west-northwest --east-south-east.

32. Obi, C.M., Mechanisms of range-front basement deformation in the Five Springs area, Bighorn Mountains, Wyoming: M.S. thesis, in progress.

A detailed structural analysis of the range front in the Five Springs area, Bighorn Mountains, Wyoming, examines two unresolved tectonic problems

of the Laramide orogeny in the Wyoming Province: 1) did the ranges rise vertically as a result of some unspecified deep seated process, or were horizontal crustal stresses responsible for range uplift on reverse or thrust faults? and 2) did the basement surface remain flat, rigid and horizontal, or did the basement surface fold, bend or rotate? Detailed mapping of the range front and analysis of cross sections with balanced cross-section techniques conclude the following: 1) the range front deformed, at least in part, by the tilting or rotation of large basement blocks; and 2) range uplift on hypothesized reverse faults satisfies field observations and best conserves volume. New roadcuts on Highway 14a transect this range front, and a brittle fracture analysis of these exposures shows a previously unreported sequence of at least three phases of Laramide-age brittle deformation in basement: 1) an early phase of mineralized strike-slip faults; 2) a middle phase of mineralized dip-slip faults; and 3) a late phase of unmineralized gouge and shatter zones. The tilting or rotation of basement blocks at the range front appears to be related to the late phase of deformation. The sequence of phases reflects the effects of horizontal crustal compression, range uplift and erosional unloading, and all three phases have similar causal maximum-compression orientations.

Missouri
Central Missouri State University
Warrensburg, Missouri 64093

33. Nold, J.L., Origin of South Pass district gold veins: study in progress.

Examination and sampling of gold veins and adjacent metamorphic host units suggests that the veins were generated during regional metamorphism.

Nold, J.L., 1986, The Jack Ranch fold near South Pass, Wyoming --its geometry, orientation, and relation to the contact of the Sweetwater Granite: Transactions of the Missouri Academy of Science, in press.

Montana
Eastern Montana College
Billings, Montana 59101

34. Zwick, T.T., Effects of the Little Ice Age (neoglacial) events in the Beartooth - Absaroka Range, Montana - Wyoming: study in progress.

The project will investigate the distribution of neoglacial ice advances and associated climatic events, landforms and periglacial progresses.

Montana State University
Bozeman, Montana 59171

35. Locke, W., and Meyer, G., Late Holocene vertical deformation of Yellowstone Lake shorelines: study in progress.

Precision leveling profiles across raised lake shorelines in the Yellowstone Basin have allowed the identification of at least six well-developed terraces. Correlation of these terraces reveals regional deformation both similar to and different from that determined by historical regional leveling. Dating of the shorelines (in progress), should allow the determination of absolute rates of deformation, and imply rates of uplift averaged more than 10 mm/yr over the past 2,500 years. This deformation, which has included both upward and downward components, is interpreted as the result of volcanotectonic deformation.

36. Olson, T.J., and Schmitt, J.G., Sedimentary evolution of the Miocene-Pliocene Camp Davis basin: study in progress.

Detailed lithofacies and provenance analysis combined with new interpretations of the depositional environment of the Camp Davis Formation.

37. Schmitt, J.G., Sedimentology and provenance of conglomerates in the Eocene Sepulcher Formation: study in progress.

Detailed facies and petrographic analysis of pre-volcanic conglomerates at the base of the Eocene Absaroka Volcanic Supergroup.

38. Schmitt, J.G., Sedimentary-tectonic evolution of the Wyoming - Idaho - Utah thrust belt: study in progress.

Sedimentologic and provenance studies of the Cretaceous to Eocene foredeep basin deposits will be integrated to reevaluate the history of structural development in the thrust belt.

39. Schmitt, J.G., Sedimentology of the Upper Cretaceous Little Muddy Creek Conglomerate: study in progress.

Lithofacies analysis of the Little Muddy Creek Conglomerate reveals deposition in a fan-delta environment.

40. Schmitt, J.G., and Olson, T.J., Sedimentology of recent debris flows: study in progress.

Detailed textural and sedimentary structure analysis of a newly discovered modern debris flow.

New Mexico
University of New Mexico
Albuquerque, New Mexico 87131

41. Kudo, A.M., Harvey, B.A., and Colvard, E., Geochemistry of Sunlight Basin intrusions: study in progress.

Geologic mapping of parts of the Beartooth Butte, Deep Lake and Dead Indian Peak Quadrangles are completed. The study also includes whole-rock

and trace element analysis with extensive electron microprobe analysis of rocks and constituent minerals. Age determination is being attempted.

Kudo, A.M., and Broxton, D.E., 1985, High-potassium intrusive rocks of the Crandall ring-dike complex, Absaroka Mountains, Wyoming: Geological Society of American Bulletin, v. 96, p. 522-528.

New York
State University of New York
Stonybrook, New York 11794

42. Lindsley, D.H., Frost, B.R., Fuhrman, M.L., Kolker, A., and Stafford, J., Petrogenesis of the Laramie anorthosite complex: study in progress.

Mapping, petrography, mineral chemistry and geochemistry of anorthosites and associated monzonite - syenite series rocks are being examined.

North Dakota
University of North Dakota
Grand Forks, North Dakota 58202

43. Karner, F.R., Halvorson, D., Jenner, G., and White, S., Geology of the Bear Lodge Mountains and Devils Tower: study in progress.

Ohio
University of Akron
Akron, Ohio 44325

44. Burford, A.E., Beck, W.C., and Berendson, E., Structural relations of Casper Mountain, Emigrant Gap anticline and adjacent areas: study in progress.

The structure and stratigraphy of the Casper area are being studied in detail. The southwest corner of the Powder River Basin and adjacent Casper Arch and Casper Mountain exhibit complex interaction of tectonic stresses. Precambrian structures are strongly overprinted by Laramide deformation. The Precambrian of Casper Mountain has been studied in detail by Gable and Burford (1982, U.S. Geological Survey Open File Report No. 82-67). Sedimentary strata of the east and west ends of Casper Mountain and the entire length of Emigrant Gap anticline have been described in detail recently. Joints, faults and flexural relations of the sedimentary strata of the Casper Mountain south flank remain to be examined.

Beck, W.C., and Burford, A.E., 1985, Stress analysis of the Casper Mountain - Emigrant Gap anticline juncture, Natrona County, Wyoming: Wyoming Geological Association 36th Annual Field Conference Guidebook, p. 59-65.

45. Corbett, R.G., Composition of wells, springs and seeps in the Casper Mountain area: study in progress.

Wells, springs and seeps have been sampled and analyzed for major and some minor constituents. The composition of samples, as portrayed on piper diagrams, reflects the composition of rock types. The degree of saturation with respect to pure mineral phases will be determined.

46. Corbett, R.G., Gloeckler, E., Quick, T., and Manner, B., Concretions in the Morrison Formation, Natrona County, Wyoming.

The field relations and mineralogy of pyritic concretions are being studied. Many of the concretions are altered to goethite.

Miami University
Oxford, Ohio 45056

47. Charles, E.G., A structural analysis of the Cache Peak area and the Granite syncline, Sublette County, Wyoming: M.S. thesis, in progress.

This study in two areas of the Gros Ventre Range is designed to elucidate the local Laramide structural style and events by detailed structural analysis. In the southeast quarter of the Turquoise Lake Quadrangle a structurally complex area (12 miles square) is being mapped in detail at 1:24,000 scale. Features such as cleavage, shear fractures, faults, stylolites and other pressure solution features are being studied to determine the principal strain direction. It is hoped that twinned calcite can be used as a quantitative measure of strain associated with folds adjacent to a major fault in the area.

Microscopic strain features (calcite twins) are being examined from exposures of Madison Limestone along the Swift Creek side of the Granite Creek syncline in the Open Door area of the Granite Falls Quadrangle. It is hoped that the nature of strain between the Cache Creek and Pyramid Peak faults can be determined.

48. Fay, D.A., Structural analysis of the Crystal Peak Quadrangle, Wyoming: M.S. thesis, in progress.

The Crystal Peak Quadrangle, T.40-41N., R.110W., has been mapped at a 1:24,000 scale with emphasis on the structures surrounding the Pyramid Peak and Shoal Creek faults. Strained calcite samples from the Mississippian Madison Formation have been measured to determine local shortening and deformation style.

49. Kochan, M., The Burnt Gulch Formation, a Pliocene-Pleistocene arkose conglomerate, in the northwestern Wind River Basin, Fremont County, Wyoming: M.S. thesis, in progress.

Objectives of the project are (1) to describe, map and determine the stratigraphic position of the tectonic arkose conglomerate that occurs on

the north wall of Torrey Valley and in other valleys along the Wind River Mountains, and (2) to compare this conglomerate with other Cenozoic strata of the northwestern Wind River Basin.

50. Sasala, C.S., Shear zones and ductile deformation mechanisms in Precambrian rocks of the Gros Ventre Mountains: M.S. thesis, in progress.

Shear zones and ductile deformation mechanisms within Precambrian basement rocks in the Gros Ventre Mountains are being studied. Samples have been collected and are being studied macroscopically and microscopically to determine the processes by which they are deformed. This information should be helpful in clarifying the problem of Laramide tectonics.

51. Thomas, S., Structural geology of the Crystal Creek area, Gros Ventre Mountains, Wyoming: M.S. thesis, in progress.

During the summers of 1984 and 1985, a study was made of the structural geology of the area adjacent to Crystal Creek in the Gros Ventre Mountains, Wyoming. A detailed geologic map (1:24,000) of the study area was completed with cross sections. Grizzly Lake and Crystal Peak Quadrangles of the U.S. Geological Survey 7½-minute series were used as base maps. The orientation of fractures was measured along five traverses using the Azimuth Verses Traverse Distance technique (Wise and McCrory, 1982). Offsets along calcite-filled fractures established some of these fractures to be shear in nature. Twinned calcite crystals from oriented limestone samples were used to determine the principle devioric strain axes (Groshong, 1972) for a portion of the fold that divides the area. A comparison is being made between the structural relationships observed in the field and the fracture and strain studies so that the nature of tectonic stresses that produced the fold (i.e. horizontal or vertical) can be inferred.

Pennsylvania
Bryn Mawr College
Bryn Mawr, Pennsylvania 19010

52. Gray, M.B., Geology and strain in parts of the Elk Valley and Snowdrift Mountain 7½-minute Quadrangles: M.S. thesis, in progress.

Mapping at a scale of 1:24,000 was done in parts of the Elk Valley and Snowdrift Mountain 7½-minute Quadrangles in order to determine the extent of deformation in the footwall area of the Meade Thrust in the Wyoming-Idaho-Utah Thrust Belt. Strain analyses are being conducted on crushed pebbles within the Cretaceous Gannett Group conglomerates.

Pennsylvania State University
University Park Pennsylvanian 16802

53. Farley, M.B., and Wing, S., Association of palynology with sedimentary environments in the lower Eocene, southern Bighorn Basin: study in progress.

The occurrence of palynomorphs in lower Eocene carbonaceous non-marine sediments are being studied to discover their association, if any, with detailed sedimentary depositional environments. The carbonaceous rocks represent two basic environments: channel fill (oxbow) lake and level - crevasse splay. A distinctive pattern of occurrence of palynomorphs in these environments and their subenvironments is sought. These patterns, in turn, can be related to the megafossil plants from these environments, studied by Scott Wing. These combined data will be used for paleoecologic interpretation.

South Dakota
South Dakota School of Mines and Technology
Rapid City, South Dakota 57701

54. Lisenbee, A.L., and Roggenthen, W., Tertiary diatremes of the Black Hills uplift, Sundance, Wyoming - Deadwood, South Dakota: study in progress.

Several breccia pipes laden with Precambrian igneous, Phanerozoic sedimentary and Tertiary igneous xenoliths are present within the Paleocene - Eocene igneous complex of the Black Hills uplift. The present study is an attempt to explain their origin.

55. Lisenbee, A.L., and Jenkins, C., Structural evolution of the east margin of the Bighorn uplift: study in progress.

This study involves tectonic analysis of the dual mechanisms of formation of the uplift to basin (Powder River) transition: a large-scale monocline on the north; complex reverse or thrust faults on the south.

56. Redden, J.A., and Rich, F., Pollen studies in abandoned Little Missouri channel: study in progress.

A core sample from a playa lake in an abandoned channel of Little Missouri River will be used for pollen studies and/or carbon dating of the capture of Little Missouri headwaters by the Belle Fourche River. Study of terrace distribution is planned to evaluate erosion rates and recent warping of the northern Black Hills.

57. Rich, F., Lisenbee, A.L., Fox, J.E., and Pish, T.A., Palynology of the Cambria Coal, Lakota Formation, Weston County, Wyoming: study in progress.

The purpose of the study is to identify the palynomorph assemblages of the Cambria Coal, and to develop further insight into the coal's peculiar composition. Analysis of sandstones and shales may accompany this work,

and a detailed depositional system will be reconstructed, based, in part, on field mapping.

Tennessee
Memphis State University
Memphis, Tennessee 38152

58. Bieler, D.B., Projects in mapping, stratigraphy and metamorphic petrology of the east flank of the Bighorn Mountains: work in progress.

The first project involves tectonic controls on pre-Laramide stratigraphy. Detailed measured sections and mapping are being combined to make interpretations of the history of basement block movement during the Paleozoic and Lower Mesozoic. Preliminary data suggest that some faults have movement histories extending from Devonian through the Lower Cretaceous and that these faults were subsequently used during Laramide deformation.

A second project concerns the petrology of the Mesaverde Group. The focus is the sandstone petrology, clay mineralogy and porosity development in the Parkman Sandstone and Teapot Sandstone.

Gerlock, J.L., 1985, Sedimentology and petrology of the Mesaverde Group (Upper Cretaceous), east flank, Bighorn Mountains, Wyoming: M.S. thesis.

Miller, D.C., 1985, Depositional history of the Tensleep Sandstone (Pennsylvanian), east flank, Bighorn Mountains, Wyoming: M.S. thesis.

University of Tennessee
Knoxville, Tennessee 37996

59. Woodward, N.B., Stratigraphic controls on thrust fault shapes, Snake River and Salt River Ranges, Wyoming: study in progress.

Parts of the lateral ramp in the St. John thrust surface were remapped at 1:8,000. Small scale structures were recorded. Deformation on the hanging wall is more intense than previously reported. Imbricated thrust slices of Triassic rocks are folded together and cut by extension faults. These later events are associated with emplacement of the hanging wall lateral thrust ramp onto a flat footwall of the Jurassic Twin Creek Formation.

Mapping of the north end of the Mount Fitzpatrick area of the Absaroka thrust system was completed. The Absaroka thrust sheet in the central Salt River Range is a folded complex of thrusts which repeat the lower Paleozoic section and die out upward into folds in the Mississippian carbonates.

United Kingdom
Portsmouth Polytechnical Institute
Portsmouth, United Kingdom

60. Hall, P., and Hughes D., Composition of mafic and ultramafic intrusives: study in progress.

Mineralogic and chemical composition of mafic and ultramafic intrusives in the Wyoming Province are being compared with similar intrusives in West Greenland and elsewhere.

United States Government
Jet Propulsion Laboratory
Pasadena, California 91109

61. Lang, H.R., Paylor, E.D., and Conel, J.E., Multispectral analysis of sedimentary basins: study in progress.

A three-year research program is proposed to evaluate the utility of remote sensing measurements for basin analysis. Using remote sensing data, stratigraphic columns and map variations in the lithology, geometry and structure of sedimentary rocks in the Wind River/Bighorn Basin area, Wyoming, will be constructed. Results of a FY 84 feasibility study clearly demonstrate that new information discovered by multisensor, multispectral remote sensing can be used for stratigraphic and tectonic analysis. Remote sensing data, and conventional geological data from available surface, borehole and geophysical surveys will be integrated and used to constrain models of basin formation and evolution.

Data available for use in the proposed study include visible and infrared (Thematic Mapper, Airborne Imaging Spectrometer and Thermal Infrared Multispectral Scanner) and Microwave (Seasat and quad-polarized aircraft Synthetic Aperture Radar). These data will be co-registered to a digital terrain base and analyzed. Photogeologic interpretations, cover classification, stratigraphic columns, cross sections and isopachous maps developed using both spectral and textural data from combined data sets will be used to map stratigraphy, structure and geomorphology of the Wind River/Bighorn Basin area. This information will be used to conduct local and regional facies, paleoenvironmental and structural analyses to depict the geologic history of the area. Remote sensing results will be compared to those obtained from conventional geological and geophysical observations to identify unique and complimentary characteristics of each.

Conel, J.E., Lang, H.R., and Paylor, E.D., 1985, Post-Laramide uplift and erosional history of northern Wind River Basin, Wyoming: American Association of Petroleum Geologists Bulletin, v. 69, p. 245.

Conel, J.E., Lang, H.R., Paylor, E.D., and Alley, R.E., 1985, Preliminary spectral and geological analysis of Landsat-4 Thematic Mapper Data, Wind River Basin area, Wyoming: Institute of Electrical and Electronics Engineers, Transactions On Geoscience and Remote Sensing, v. GE-23, p. 562-573.

Lang, H.R., Paylor, E.D., and Adams, S.A., 1985, Remote stratigraphic analysis: combined TM and AIS results in the Wind River/Powder River Basins, Wyoming, *in* Vane, G., and Goetz, A.F.H., editors, Proceedings of the Airborne Imaging Spectrometer Data Analysis Workshop: Jet Propulsion Laboratory Publication 85-41, p. 32-35.

U.S. Geological Survey
Denver, Colorado 80225

62. Bown, T.M., Bighorn Basin analysis.

Fieldwork on the Willwood Formation in FY 1986 will stress completion of the Willwood measured section, including tying in fossil vertebrate localities from the 560 through 770 meter interval. Collecting of fossils will focus on filling in stratigraphic data gaps, especially those near faunal stage boundaries. A single coterminous and temporally contiguous alluvial ridge and floodplain unit will be examined to determine the depositional facies, paleosol development and temporal balancing of the unit -- a procedure never before accomplished in continental sediments and a direct result of the paleosol conceptual breakthrough made in FY 1985. Laboratory reports emphasizing the new data on sediment-paleosol integration, details on the lower Eocene mammal zonation and paleosol-determined climates of the Willwood Formation will be in preparation. Fieldwork is also planned in the Paleocene of southern Montana, and preliminary report of the results of this research should be completed by late 1986.

A proposal to the National Geographic Society on the mechanisms of displacement of the world's largest debris-avalanche landslide will be submitted in FY 1986 for proposed fieldwork in the Bighorn Basin site of the landslide. This massive, catastrophic event in Wyoming was nearly an order of magnitude greater than any other now recognized landsliding on the Earth or Mars and, because of its relatively youthful age (about 2.0 mybp) and association with the large, presumably quiescent volcanic field (The Absaroka Range of Wyoming), might well be considered with modern-day landslide hazards. Fieldwork is proposed in the Bighorn Basin site of the landslide.

63. Coates, D.A., Origin of clinker and paleosols.

Ages of burning of the Wyodak coal have been used to interpret the rate of backwasting of the scarp held up by the clinker and the rate of downwasting of the landscape as a whole. Additional samples for further fission-track dating of clinker in the northern Powder River basin will be collected in FY 1986. Reports on the significance of fission-track dating of clinker in understanding landscape evolution in the Powder River Basin and of the petrology of paralava, the melted phase of clinker, as well as a map of clinker on the north flank of the Powder River Basin in Montana are being prepared.

64. Denson, Norman, Tertiary geology and uranium occurrence, Powder River Basin, Wyoming and Montana.

Geologic maps (scale 1:100,000) and reports that describe the geology and heavy-mineral distribution in the Tertiary and uppermost Cretaceous rocks in the Douglas, Gillette, Sheridan, Birney, Buffalo and Recluse 1° Quadrangles are in technical review. Two regional geologic maps of the Powder River Basin at 1:200,000 scale, with structure contour overlays on the top of the Upper Cretaceous Pierre shale, the Upper Cretaceous Dakota Sandstone, and the Pennsylvanian Minnelusa Formation, will be prepared in FY 1986.

65. Dolton, G.L., Methodology for resource assessment.

Field size, finding rate and play analysis studies of the Minnelusa Formation, Powder River Basin, Wyoming and Montana, will be in progress. A topical study of overpressured gas-bearing sandstones in southwestern Wyoming is also planned.

66. Dzurisin, Daniel, Physical processes in large silicic magma systems.

At Yellowstone National Park, this project will continue to: monitor contemporary crustal deformation and its relationship to other types of unrest; determine the caldera's Holocene deformation history; and develop a quantitative conceptual model to access the current balance between magmatic heating and hydrothermal cooling. A major goal of the monitoring effort is to resurvey the entire level network, which was last measured in 1977, and to establish a global Positioning System network to extend the coverage available through level and trilateration surveys. The fieldwork is currently focused in Pelican Valley, and will pursue further the question of Holocene deformation at Yellowstone by surveying stream terraces and assessing stream responses to Holocene deformation. Repeat precise level and trilateration surveys are planned at the Yellowstone caldera.

67. Flores, R.M., Depositional environments of coal.

Fieldwork and collection of stratigraphic and sedimentologic data in the Powder River and Raton coal basins will continue in FY 1986, along with the preparation of cross sections, paleogeographic maps and reports.

68. Fournier, R.O., Hydrothermal fluids.

This project will continue to oversee the operation of the stream-gaging stations and chemical-monitoring system in the Yellowstone National Park in FY 1986. A report interpreting the results of the first two years of operation of these systems will be prepared for publication. Interpretation of accumulated geochemical results from Yellowstone National Park, with emphasis on Norris data and chemical and hydrologic processes that have application to ore deposition, will also continue. Utilizing data supplied by the U.S. Fish and Wildlife Service, a geochemical classification of the lakes and streams in Yellowstone National park, with particular attention to hydrothermal water contribution, will be compiled.

Hot springs at Yellowstone National Park were submerged when Jackson Lake was formed by a dam; the lake will be drained in FY 1986 for

strengthening of the dam. This will provide an opportunity to sample the hot springs and to determine if those waters have chemical and isotopic similarities to the Yellowstone hydrothermal system.

69. Fox, J.E., Mast, R.F., and Dolton, D.L., An integrated approach using computer data files in the geological assessment of hydrocarbon resources of the Powder River Basin: study in progress.

Geologic data from approximately 200 of the deepest, strategically located oil and gas wells in the Powder River Basin were used to construct a series of 20 east-west electric log cross-sections. On these cross-sections, formation tops, key bentonite beds, major unconformities and stratigraphic pinchouts were identified to illustrate stratigraphic relationships of Upper Cretaceous through Pennsylvanian and, in some cases, older strata in the basin. A computer file was then made to include these geologic data from which computer generated structure contour maps and regional isopach maps of important hydrocarbon source rock and reservoir rock units were made.

A comprehensive geologic well data file was also developed from the Well History Control System (WHCS). Independent verification of the WHCS data was undertaken to correct obviously spurious information. A number of structural contour maps of several of the major objective units in the basin were then computer generated from this data file.

The major oil and gas plays in the basin were geologically described, geographically delineated and their boundaries digitized to provide a framework for stratigraphically and geographically managing and editing data for use in resource assessment studies. Exploratory wells, oil and gas fields or pools and oil and gas shows were plotted on maps of these play areas and on maps of the entire basin area. Drilling statistics were also compiled from the WHCS data base of approximately 30,000 exploration and development wells in the basin.

The combination of these computerized data management and display systems makes it possible for geologic, drilling and production data to be easily cross-checked and integrated. The products of this kind of approach aid in assessment of the exploration maturity of oil and gas plays and the appraisal of future oil and gas resources.

70. Hanley, J.H., Depositional environments of the Fort Union and Wasatch Formations, Powder River Basin, Wyoming-Montana.

In FY 1986, field and laboratory data will be synthesized and the taphonomy and paleoecology of nonmarine Mollusca in the upper Tongue River Member of the Fort Union Formation, northern Powder River Basin, Wyoming will be studied. A major palynostratigraphic study of the Paleocene of the Powder River Basin will be initiated in FY 1986, including collecting, preparing and analyzing samples from the lower Fort Union Formation. Collections will be made from the type area of the Tullock Member in order to firmly establish the palynomorph sequence within the basal Paleocene. Samples will be collected from the Lebo Shale Member and additional referred collections to establish basin-wide time lines.

Paleoclimate data will be gathered in the Powder River Basin, from the Lance/Fort Union contact interval in the Kaycee area, Wyoming, and possibly from the Hell Creek/Fort Union contact interval along the Yellowstone River, in Montana. A pilot palynological study of the Anderson seam will be initiated, and samples will be acquired from the Decker mine cores.

Leaf assemblages from latest Cretaceous (Lance and Hell Creek Formations) through late Paleocene (Tongue River Member, Fort Union Formation) age will be sampled and analyzed to determine the general framework of vegetational change and climatic factors that relate to nonpeat vs. peat deposition in the Powder River Basin. Specific sections to be sampled are in the southwestern and northeastern part of the basin.

Plans also include additional excavation at Newall's Nook, as well as prospecting further in the region around the quarry. Following fieldwork, a brief synopsis of the age and paleontology of this and any other newly discovered localities will be prepared.

71. Hobbs, R.G., Methane in coal.

The objective of the methane in coal project is threefold: (1) by regional and detailed geologic studies gain a greater understanding of the origin/source and the retention mechanisms of the methane occurring as an integral part of a coal seam, (2) compilation and assessment of the methane in coal resources together with related data computerized in a methane in coal data base and (3) to provide research into the geophysical logging instrumentation and methodology that will assist in the evaluation of the methane resources.

Initially, the geologic studies will focus on three specific areas in the Powder River Basin: geothermal mapping, Big George [coal] cooperative study and the continuation of the model studies of the Recluse area. These studies will expand into other parts of the Powder River Basin, the San Juan, Uinta, Piceance and Green River Basins and the ongoing Basin Analysis program. Coal core sampling for methane and geophysical logging is planned in the Denver Basin, and the data will be incorporated into an ongoing study in the Marshal area (western Denver Basin). Similar studies in the Powder River Basin are also planned.

During the first year, the methane data base will be established and coordinated with the National Coal Resources Data System and existing data from the Powder River Basin will be entered.

The geologic studies will begin with the formulation of the Powder River Basin geothermal base map. The initial evaluation of the required data points within the basin will be completed.

The data for the Recluse model area study will be compiled. The base map for this area will be plotted showing the initial data points for the methane evaluation.

72. Hoover, D.B., Electrical techniques for shallow/medium depth exploration.

Preliminary interpretation of data from the Yellowstone-Island Park caldera complex indicates that much of the Island Park part of the complex is a hot, dry rock system and may be the largest single geothermal resource in the country.

73. Houston, R.S., Precambrian geology of southeastern Wyoming.

Mapping of the Sierra Madre Mountains will be completed in FY 1986, and the final version of a 1:50,000 scale geologic map of the Medicine Bow Mountains will be submitted for review and publication.

74. Kent, B.H., Powder River Basin evolution.

A thin-section study of a preliminary collection of Lance sandstone samples will be completed in FY 1986, and statistical tests will be performed on the thin section data to determine whether or not there are different mineral assemblages indicative of different source areas within the Lance. Field excavation of a Paleocene fossil locality in the northwestern Powder River Basin, processing of samples and identification of investigations of selected drainages within the basin and general reconnaissance of other parts of the basin will be underway. Selected geophysical logs in and around the Kaycee Quadrangle in Wyoming will be reinterpreted. The redox-zone stratigraphic occurrence along the Pine Ridge, southwestern Powder River Basin, will be mapped, and the absolute time of northern Casper Arch activity, using mammalian and paleontological field data, will be determined. Regional chemical and mineralogic studies of the Wasatch and Fort Union Formations will continue (with emphasis on pyrite and sulfur content generally). These studies will include surface and subsurface stratigraphy and sedimentology of these formations in the southern part of the Powder River Basin. Structural and tectonic analyses of the southwestern and western (Bighorn) part of the basin and stratigraphic and sedimentologic studies of a Triassic and Jurassic interval along the western margin of the Powder River Basin will be initiated.

75. Kieffer, S.W., Multiphase fluid flow in geothermal and volcanic systems.

A probe was reinserted into the Old Faithful geyser in FY 1985, verifying earlier results and improving the thermocouple design so that reliable measured temperatures were obtained. Pressure was measured during the recharge intervals and during eruptions. A reservoir was designed for simulating Old Faithful's eruption dynamics (liquid-gas vaporization); high-ressolution pictures were obtained of the liquid-vapor eruptions; and a major review of heat transfer from dikes was completed.

Specific plans for FY 1986 include completing the analysis of the probe data from Old Faithful, and possibly more fieldwork at Mount St. Helens that will include the study of erosion surfaces under volcanic deposits. Two reports on the dikes and breccia bodies of the San Rafael Swell in Utah and a map of the dike swarm will be completed.

76. Kulik, D.L., Geophysical studies of Bureau of Land Management lands in Colorado, Wyoming, Idaho, Montana and Utah.

Plotting of existing gravity and magnetic data will be completed and collection of additional field data will be initiated in the Sweetwater Canyon, Honeycombs, Cedar Mountain, Medicine Lodge, Alkali Creek and Trapper Creek areas in Wyoming.

77. Law, B.E., Western tight gas reservoir research.

During FY 1986, petrographic and X-ray mineralogy studies conducted in the northern part of the Green River Basin will be extended to include rocks in the eastern Greater Green River Basin. The resources of tight gas reservoirs in the Piceance Creek Basin will be assessed. The study of cores from DOE's Multiwell Experiment suite will continue. Resource assessment of the Pinedale anticline, northern Green River Basin, will be completed, and the timing of cooling events in the Greater Green River Basin, using apatite fission-track dating, will be determined.

78. Love, J.D., Geology of the Teton-Jackson Hole region, Wyoming.

The geologic map of the Grand Teton National Park will be submitted for publication in FY 1986. Geologic maps of the Cache Creek, Turquoise Lake, Teton Village and Gros Ventre 7½-minute Quadrangles are being compiled and will be submitted for review and publication. Fieldwork in the Lava Mountain, Fogwater Pass and Tripod Peak 7½-minute Quadrangles will continue.

79. Pierce, F.W., Geostatistical analysis of the coal resources of the Powder River Basin.

Coal correlations, necessary for establishing homogeneous data sets for geostatistics, are 90 percent complete for the Buffalo 1° Quadrangle. Approximately 25 percent of the stratigraphic framework for the Powder River Basin has been constructed; the remainder will be completed in FY 1986. Structure contour and isopach maps of the principal coal beds in the Buffalo Quadrangle are in preparation.

80. Pierce, K.L., Age and dynamics of glaciations, Jackson Hole area, Wyoming.

Field investigations concentrating on the extent of older glaciation in southern Jackson Hole, the height of younger glaciation northeast of Jackson Hole and the neotectonic deformation will continue during FY 1986. Soils will be sampled from ten pits in addition to the five presently sampled. Obsidian from different deposits and different source areas will continue to be collected and sections sampled for chemical analyses.

Soil carbonate samples will be collected from drier areas and analyzed for Uranium-series dating. Loess samples will continue to be collected for thermoluminescence dating.

Submerged paleoshorelines are thought to exist around the margin of Jackson Lake based on the position of the lake, the Teton fault, the low gradient outlet of the lake and old echo-profiling near the margins of the lake. FY 1986 plans include about three weeks of sidescan sonar and seismic reflection traverses around the perimeter of Jackson Lake to see if

such shorelines exist and to record both the age and amount of post-glacial offsets on the Teton fault.

Archaeological field investigations of the Lawrence (three-square-kilometer occupation area) and other sites exposed by temporary lowering of the Jackson Lake Reservoir will continue. A report on relevant Quaternary geology and reservoir erosion and sedimentation will be prepared. Field investigations of Quaternary units exposed in trenches and excavations at the Lawrence site and other lake-shore sites will be ongoing.

81. Reynolds, R.L., Source of magnetic anomalies over hydrocarbon deposits.

Causes of the pervasive magnetic overprint in the Preuss Formation in the Idaho-Wyoming-Utah thrust belt will be investigated. Rock magnetic properties, including magnetic strain parameters, and temperature constraints (from vitrinite reflectance and conodont alteration) will be determined and used to formulate a model of remagnetization. Diagenetic study of the Preuss Formation will be completed.

Studies of the magnetic properties of authigenic Fe-bearing minerals will continue to permit magnetic modeling of rocks that contain these minerals. Such minerals include pyrrhotite (from the cap rocks of a Louisiana salt dome and from the Green River Basin) and siderite (iron carbonate), which has a high magnetization of unknown origin.

82. Roehler, H.W., Green River Basin framework.

Regional surface and subsurface cross sections of the coal-bearing Fort Union and Lance Formations will be constructed in FY 1986 along the eastern margin of the greater Green River Basin. These cross sections will identify, correlate and display thicknesses of coal beds. A regional surface and subsurface study of the Almond Formation will be undertaken along the eastern margins of the Great Divide and Washakie Basins. Reconnaissance of the area indicates that the continental Almond Formation is nearly 800 feet thick and coal-bearing to the south, but the formation completely wedges out in marine shales of the Lewis Formation to the north. Basinwide structure and isopach maps will be prepared for the Ericson-Pine Ridge-Teapot Sandstone. Investigations of cyclic deposition of coal in paralic Cretaceous rocks will continue. These cycles result from the alternate salt-water flooding and freshwater infilling of coastal bays. Investigations of the distribution of heavy-mineral placer deposits along a strand-plain shoreline in the Upper Cretaceous McCourt Tongue of the Rock Springs Formation will also continue. The deposits occur in six depositional settings, primarily as a result of pronounced southwest directed longshore currents. Entire Eocene sections have been measured and described in surface rocks in the Green River and Washakie Basins west and east of the Rock Springs Uplift. The stratigraphy of the Wasatch, Green River and Bridger Formations in these sections will be correlated and stratigraphic nomenclature problems will be resolved.

83. Schenk, C.J., Geology of selected bitumen deposits of the United States.

The emphasis of this project was changed in FY 1986 to enhanced oil recovery of selected major U.S. oil reservoirs; tar sands will no longer be studied. In FY 1986, the sedimentology, diagenesis and geochemistry of Cretaceous shelf sandstones and late Paleozoic sandstones of the Powder River Basin, Wyoming will be characterized to provide a geologic data base for future enhanced oil recovery projects.

84. Schneider, G.B., Sedimentary petrology.

This project will begin by describing the petrology of the McCourt Sandstone tongue in the Rock Springs uplift. The purpose will be to determine the differences in depositional environment of the upper, middle and lower strand-plain; and the forebeach of the particular section in the Minnie Gap area. Attention will then be focused on the distribution of heavy mineral placers that are present at the top of the tongue with an eye toward determining the composition of these placers and using them on a regional basis to determine strand-lines and ultimately as a framework for correlation based on mineral content and distribution (provenance). Changes in color and composition of cementing material (smectite and hematite) will also be used in this study.

The second year, materials from the Powder River Basin will be examined to see if heavy-mineral study can be used to delineate sedimentational trends in the Tertiary; and used to pinpoint provenance and distribution patterns. This work will be used to produce a series of isochrons within the basin.

85. Seeland, D.A., Stratigraphic analysis of Tertiary basins.

A report on the early Eocene paleogeography of the Bighorn Basin is being prepared. Study of electric logs of Tertiary rocks in the Kaycee area of the southwestern Powder River Basin will continue; stratigraphic cross-sections and isolith maps will be prepared, and uranium and coal occurrences will be related to lithologic patterns as interpreted from log and outcrop studies. A cooperative stratigraphic-sedimentologic study of the Tertiary rocks of the Powder River Basin will be initiated with geologists of the Energy Minerals, Coal, and Oil and Gas branches.

86. Snyder, G.L., Southwest continental core, Wyoming.

In FY 1986, fieldwork will be completed in the Spanish Mines and Q-Ranch 7½-minute Quadrangles. Geologic maps of the Seminoe Dam, Reese Mountain, Hightower SW, Fletcher Park and Johnson Mountain Quadrangles and a Professional Paper on the Hartville uplift, with geologic map, are being prepared for review and publication.

87. Stanton, R.W., Coal petrology.

Samples collected in FY 1985 from the Wyodak-Anderson coal bed northeast of Gillette, Wyoming, will be analyzed in FY 1986 to evaluate the geologic effects of geometry and controls on quality and petrographic composition of the bed and to complete stratigraphic and petrographic syntheses.

A series of cores from Wasatch Formation coal beds in Montana and Wyoming have been subdivided by facies for petrographic analysis. These coals represent clearly different stratigraphic associations and possibly very different formational conditions; all core holes are fairly closely spaced, correlated and have been sampled for chemical studies.

88. Worl, R.G., Wyoming Bureau of Land Management Wilderness Study areas.

A report on the mineral-resource potential of the Honeycomb Buttes Bureau of Land Management Wilderness Study area has been submitted for technical review and publication. During FY 1986, a report on the mineral-resource potential of the Ferris Mountains area will be completed, and field studies will be initiated on other Wilderness Study areas in Wyoming in accordance with priorities and schedules established by the Bureau of Land Management.

Utah
Utah State University
Logan, Utah 84322

89. McCalpin, J., Geologic hazard inventory mapping: study in progress.

Slope failures are being mapped on 270,000 acres of the Bridger-Teton National Forest for the U.S. Forest Service. Photogeologic mapping on 1:15,840 air photos was transferred to 1:24,000 topographic bases or orthophotoquads.

Washington
Yakima Valley College
Yakima, Washington 98907

90. Campbell, N., Caves and fossil karst of northwestern Wyoming: study in progress.

This is an ongoing study of caves in the Bighorn and Teton Mountains. It includes the study of exhumed karst in Mississippian carbonates and mapping and hydrology of caves in each area.

Wisconsin
University of Wisconsin - Eau Claire
Eau Claire, Wisconsin 54701

91. Myers, P.E., Geology and chemistry of obsidian in the southern Tetons and northern Snake River Range: study in progress.

University of Wisconsin - Madison
Madison, Wisconsin 53706

92. Decker, P.L., and Craddock, C., Detachment structures in the Greybull River - South Fork Shoshone area, Absaroka Range: study in progress.

This study is to begin in June, 1986, and will focus on the origin of a group of displaced masses of Eocene volcanic rocks which rest on various volcanic and volcaniclastic units in the Absaroka volcanic series. These transported masses occur in the upper drainages of the Greybull and Wood Rivers west and southwest of Meeteetse, Wyoming, and the drainage of the South Fork of the Shoshone River southwest of Cody, Wyoming. The purposes of the study are to reveal the structural geometries of upper and lower plate rocks, to identify positively the stratigraphic units involved with respect to the modern stratigraphic nomenclature of the Absaroka province, to decide whether these displaced masses were transported as a formerly continuous allochthon or were emplaced separately, to constrain the timing and duration of the event(s) and to identify transport directions, mechansims of emplacement and factors which may have initiated detachment.

Field study will include detailed mapping and observation of the detachment surface(s), upper and lower plate units and rock units of adjacent areas. This will be followed by laboratory research involving fabric studies, petrographic work and perhaps radiometric dating and chemical analyses. While the principal emphasis of the investigation will remain on structural geometry, kinematics and timing, mechanical modeling of these structures based on field relationships, laboratory findings and published data on the physical properties of such rocks will also be attempted.

University of Wisconsin - Milwaukee
Milwaukee, Wisconsin 53201

93. Paull, R.A., and Paull, R.K., Conodont biostratigraphy of the Lower Triassic Dinwoody Formation.

About 35 sections in Wyoming have been measured, described and sampled. Samples are being processed for microfossils (dominantly conodonts).

Wyoming
Geological Survey of Wyoming

94. Case, J.C., Landslides in Wyoming.

The Geologic Hazards Section is currently working on a landslide inventory for the State of Wyoming. The project is funded through the U.S. Geological Survey Landslide Hazard Reduction program. All existing information on landslides in the State has been compiled and used as a guide to flag areas that need additional mapping. Nearly all compiled information will be checked on aerial photographs, and some will be checked on the ground. Detailed mapping is being conducted in Uinta, Lincoln, Teton and

Park Counties, as the compilations have indicated that those areas have the highest incidence of slope instability in the State. A map showing landslides and landslide occurrence zones will be available by January, 1987.

95. Case, J.C., Geological hazards mapping in Wyoming.

Numerous geologic hazards other than landslides are being mapped or investigated in Wyoming. Much historic data on earthquakes has been compiled, as has information on active faults. Active faults in Lincoln and Uinta counties will be examined in 1986. It is expected that some of the faults will be trenched in an attempt to estimate their recurrence of movement intervals.

Naturally occurring toxic elements are also under investigation. Information is being compiled on radon and its decay products. We expect to participate in a radon monitoring program for the State. Selenium is another element to be investigated. Considerable information has been collected on the occurrence of selenium in Wyoming. We expect to begin a preliminary study on the occurrence of selenium in 1986. Sampling and analysis procedures will be refined in the preliminary program.

Information on shrinking-swelling clays is being compiled. Where possible both geologic and soils information is included in the compilation.

96. Harris, R.E., Long-term projects of the Uranium and Industrial Minerals Section:

Background gamma-radiation in Wyoming.

Calculated cosmic radiation and measured background levels averaged for each mappable rock unit compose the background gamma radiation for the State. Data from this project are being compiled on 1:250,000 AMS map quadrangles. Completed: Torrington and Cheyenne Quadrangles. Nearing completion: Ashton and Newcastle. To begin 1986: Casper. After all 16 are complete, a 1:500,000 scale map and explanation will be prepared.

Wyoming bentonite.

Bentonite throughout the State is being sampled and studied for the variability of chemical, mineralogical and rheological properties. The southern quarter of Wyoming has been sampled.

Nonmetallic mineral resources of Wyoming.

The Section is compiling and collecting information on industrial minerals in Wyoming.

Nonconformity-related uranium in Wyoming.

The Section is studying the Precambrian-Phanerozoic nonconformity in Wyoming for favorability for nonconformity-related (Canadian and Australian-type) uranium deposits.

97. Hausel, W.D., South Pass, Wyoming, mapping project: study in progress.

This project; funded by the U.S. Geological Survey COGEOMAP program, proposes to map the entire South Pass Archean supracrustal terrain at a scale of 1:24,000. Quadrangles that have been or will be mapped include Radium Springs, Lewiston Lakes, NE Parting of the Ways, Anderson Ridge, South Pass City, Atlantic City, Miners Delight and a portion of Louis Lake.

All accessible historic gold mines are being mapped and, to date, 20 have been completed. Gold geochemistry and wall rock alteration studies are also being conducted. The overall objective of the project is to prepare a regional map on a 1:50,000 scale and to categorize all mineral deposits in the greenstone belt.

98. VerPloeg, A.J., Geologic mapping of the southeastern flank of the Bighorn Mountains, Johnson, Natrona and Washakie Counties, Wyoming: study in progress.

The southeastern flank of the Bighorn Mountains was last mapped by Darton in 1906 at a scale of 1:250,000. The area represents a major recharge area for Paleozoic aquifers and has potential for shallow oil or tar sand occurrences. This project, funded by the U.S. Geological Survey COGEOMAP program, proposes to map a total of 20 7½-minute quadrangles in the area west of Kaycee, Wyoming. The Fraker Mountain and Barnum Quadrangles were completed in 1985 and the Mayoworth and Red Fork Powder River Quadrangles should be finished in 1986. Quadrangles to the south and west of the completed maps will be mapped in subsequent years.

University of Wyoming
Laramie, Wyoming 82071

99. Albert, G.K., Mineralogical aspects of kimberlites and their significance for exploration: M.S. thesis, in progress.

A study of the mineral associations of selected Wyoming kimberlites and an evaluation of these kimberlites relative to kimberlites of similar mineralogy elsewhere in the world.

100. Angevine, C.L., and Babits, S., Isostatic compensation of the Laramide uplifts of Wyoming: study in progress.

We are investigating the mechanism of isostatic compensation of several Laramide basement - uplifts in the Wyoming foreland province. Free air gravity anomalies over the uplifts and adjacent sedimentary basins show the uplifts to be undercompensated and the basins to be over compensated. Given the short wavelength of the uplifts, it is likely that the uplifts are regionally compensated by flexure of the lithosphere.

101. Angevine, C.L., and Flanagan, K., Epeirogenic uplift of the Wyoming province: study in progress.

This is an investigation of the timing and magnitude of the post-Laramide uplift of the Wyoming province. Backstripping techniques are employed to determined paleo-sea level. By comparison with extant sea level curves, the magnitude of the uplift is determined. Assuming that subcrustal thermal processes are responsible for this uplift, some constraints on timing of the uplift are obtained.

102. Bierei, M.A., Hydrocarbon maturation, source rock potential and thermal evolution of the Late Cretaceous and early Tertiary rocks of the Hanna Basin, southeastern Wyoming: M.S. thesis, in progress.

103. Chronic, L.M., Faunal patterns across two trilobite extinctions: M.S. thesis, in progress.

104. Dahoda, J.P., Structural and tectonic analysis of the Great Divide Basin, Wyoming, using enhanced imagery: M.S. thesis, in progress.

A compilation of geologic data for the Great Divide Basin with modifications as indicated by interpretations of Landsat imagery and subsequent field checks.

105. Davidson, J.R., Stratigraphy and mammalian paleontology of Cooper Lake Basin: M.S. thesis, in progress.

This project is primarily designed to provide a description of previously undescribed mammalian fauna from the Copper Lake Basin area. This fauna, from the Wind River Formation of the Laramie Basin, will be correlated with other early Eocene faunas. The number of taxa represented in the fauna has nearly doubled since the faunal list was first published by Princhinello (1971). Interesting additions include multituberculates, insectivores and aptiodactyls.

106. Doremus, D.M., Ground-water circulation and water quality associated with Tensleep and Madison aquifers, northeast Bighorn Basin, Wyoming: M.S. thesis, in progress.

107. Fountain, D.M., Gorham, J., Minnich, G., and Burke, M., Seismic properties of rocks from the Wind River Range: study in progress.

The project involves measurement of seismic properties of Wind River Range rocks at high pressures to examine the nature of reflectivity of the Archean crust.

108. Frost, C.D., and Frost, B.R., Archean geology of the northern Wind River Mountains: study in progress.

We are working to establish the sequence of Archean events which produced the crust in this part of the Wyoming Province. The project includes detailed mapping, characterization of metamorphic conditions during at least two high grade metamorphic events and isotopic dating of Late Archean granites.

109. Gilmer, D.R., Landsliding and slope development in the Meeks Cabin Reservoir and Buck Fever Ridge Quadrangles, south-central Uinta County, Wyoming: M.S. thesis, in progress.

110. Groll, P., Depositional setting of the Bridger Formation along the Continental fault: M.S. thesis, in progress.

111. Gubbels, T.L., Tectonic evolution of the Owl Creek Mountains: M.S. thesis, in progress.

A study of the interaction of distinct structural events that produced the unique geology of the eastern Owl Creek Mountains. From examinations of interactions between deformational patterns, a structural history is being developed.

112. Harris, M.T., Geobotanical association of sedimentary rocks, Deadman Butte area, southern Bighorn Mountains: M.S. thesis, in progress.

This is an examination of the vegetation communities and their association with recognized formations and lithologic units occurring on the flank of the Bighorn Mountains. The study attempts to identify those botanical variations that might influence the spectral response of these units.

113. Heasler, H.P., Preliminary numerical analysis of the thermal regime south of Yellowstone National Park in Jackson Hole, Wyoming: study in progress.

The primary purpose of the study is to investigate the possibility of high temperature (greater than 150°C) heat sources in the general area of Jackson Hole. This will be accomplished through finite difference numerical modeling of conductive and convective heat transport. Constraints for the computer model will be from existing hydrologic, thermal and geologic data.

114. Heller, P.L., Paola, C., and Winslow, N., Sedimentation during the nascent Sevier Orogeny: study in progress.

The study concerns the depositional and tectonic history of the Cloverly Formation and equivalent conglomeratic units in the western interior (upper Ephraim Conglomerate, Lakota Formation, etc.). The project involves detailed facies analysis, isotopic study of detrital clasts and flexural and paleohydraulic modeling.

Heller, P.L. Bowdler, S.S., Chambers, H.P., Coogan, J.C., Hagen, E.S., Shuster, M.W., Winslow, N.S., and Lawton, T.F., 1986, Time of initial thrusting in the Sevier orogenic belt, Idaho, Wyoming, and Utah: Geology, in press.

115. Hunter, R.B., Timing and structural interactions between the Prospect Thrust system, antithetic Game Hills Thrust, and Gros Ventre foreland uplift, Hoback Basin, Wyoming: M.S. thesis, in progress.

116. LeFebre, G., Subsidence and tectonic development of the Hanna Basin, Wyoming: PhD dissertation, in progress

117. McElhaney, D.A., Depositional environments and provenance of the lower Tertiary Ferris and lower Hanna Formations, Hanna Basin, southeastern Wyoming: M.S. thesis, in progress.

118. Marlatt, G., Geologic analysis of the Twin Peaks metamorphic complex, southern Laramie Range, Wyoming: M.S. thesis, in progress.

Landsat thematic mapper imagery and field studies were employed to produce an improved geologic map of a region of poorly understood metamorphic rocks.

119. Marrs, R.W., Analysis of the tectonic framework of the Bighorn Basin: study in progress.

Landsat imagery of the area have been interpreted, and major structural features are interpreted by statistical analysis of the image interpretation. Features identified by image analysis will be correlated with features identified from other geological data and geophysical surveys. Maps will be completed at 1:1,000,000 scale.

120. Mears, B., Jr., Non-glacial geomorphic development of the Laramie Basin: study in progress.

Topics include: the structural setting of the Laramie Basin, fluviatile landforms and their history, periglacial features, microtopography and eolian depositional and erosional features. The paper is currently being edited for inclusion in the Geological Society of America Centennial Volume on non-glacial features of basins in the Rocky Mountains.

121. Mears, B., Jr., 1986, An illustrated compendium and review of Pleistocene wedge-polygon sites in the Wyoming plains with emphasis on the Laramie Basin: Geological Survey of Wyoming, in preparation.

Some 75 sites of late Pleistocene ice-wedge casts and sand-wedge relics are mapped and described with accompanying photographs and line drawings. An introductory discussion summarizes the general features of the periglacial wedges, and presents their general distribution on geomorphic surfaces in the Laramie Basin.

122. Mizell, S.A., Kerr, G., and Wiersma, U., Stream-aquifer interaction as a possible source of recharge to the Paleozoic aquifer along the Laramie Mountains, Laramie County, Wyoming: study in progress.

This project is directed toward two objectives. First is the estimation of recharge to a regional aquifer from surface streams crossing the outcrop of aquifer formations. Second is the characterization of recharge flow through fractures and joints in the aquifer formations. Recharge is being estimated by measurement of stream losses up and down stream of the aquifer formation outcrop and by monitoring shallow ground-water pressure head as an indicator of the vertical movement of water. These data have been collected routinely for about four months and suggest that up to 50 percent of the stream flow may be lost through the study reach. Field work

to characterize recharge flow through fractures will be initiated during the spring and summer of 1986. Techniques to be employed include mini-piezometer installation in fracture zones and detailed analysis of stream flow across individual fracture zones.

123. Myers, J.D., The Precambrian Lake Owens Mafic Complex, southeastern Wyoming: a detailed petrologic investigation of an oxide-rich unusual layered mafic complex: study in progress.

It is proposed to conduct a detailed petrologic study of the Lake Owens Mafic Complex (LOMC), a Precambrian body in southeastern Wyoming. This intrusion is a cup-like, layered body that has been tilted to reveal a 4.5 km thick section. Preliminary mapping indicates the body contains norite, gabbro, troctolite and anorthosite, has isomodal, mineral- and size-graded layers and is unmetamorphosed. The LOMC has many characteristics that set it apart from most other layered mafic bodies. In particular, it is characterized by: 1) a cyclic distribution of oxide phases in the basal and upper portion; 2) early, primary cumulus orthopyroxene and a general absence of olivine; 3) an overall leucocratic nature; and 4) a lack of extreme differentiation. Such characteristics suggest that oxides were an early crystallizing phase (i.e. at low percent solidification) and $aSiO_2$ was high in the primary liquid. Thus, a detailed study of this body may expand our knowledge of the processes that generate layered bodies. Because of the absence of detailed geologic and geochemical data, the present proposal is designed to acquire such data and begin preliminary petrologic studies. Specific objectives include: 1) mapping the LOMC in detail; 2) obtaining basic petrographic data; 3) analyzing a representative suite of samples for bulk rock (major and trace element) compositions; and 4) acquiring microprobe data on cumulus and intracumulus minerals. These data will be used to calculate T, P, $aSiO_2$, and fO_2 of crystallization and determine how these variables changed as the magma crystallized. Due to the apparently high fO_2 and $aSiO_2$, changes in these variables may have been very different from those that accompanied crystallization of most layered intrusions (e.g. Skaergaard, Kiglapait). Indeed, the probable high fO_2 of the parental liquid suggests it may have followed a fractionation trend dominated by oxide crystallization (Osborn, 1959). If so, this body is unique among most layered bodies and volcanic suites.

124. Novacovich, B., Style and development of structure at Elk Mountain, Wyoming: M.S. thesis, in progress.

Statistical analyses of Landsat-defined features in the crystalline core of the Elk Mountain uplift are employed in an analysis of the structural style of the uplift. Various theories have been proposed for the structural development of this area, and the deformational style of the crystalline core of the uplift is a critical component of this debate.

125. Renner, J.M., Stratigraphic and sedimentologic significance of the Paleozoic-Mesozoic boundary, southeastern Wyoming: M.S. thesis, in progress.

126. Schmidt, K., Spectral stratigraphy of sedimentary rocks, northern Laramie Basin: M.S. thesis, in progress.

Thematic mapper imagery is used as a data base to define the spectral character of sedimentary units cropping out along the margin of the Laramie Basin. The lateral continuity of these spectral features are examined to determine the potential for using the image data to define facies contrasts.

127. Southwell, E.H., Depositional and pedogenic processes of the Fort Union Formation, Bison Basin, central Wyoming: M.S. thesis, in progress.

128. Sperr, J.T., Xenoliths of the Leucite Hills volcanic rocks, Sweetwater County, Wyoming: M.S. thesis, in progress.

129. Steidtmann, J.R., Laramide basement uplift and basin subsidence in the vicinity of the COCORP Wind River Seismic Profile: study in progress.

Geologic studies have most commonly focused on uplifts as evidence of foreland crustal deformation but information concerning both basement uplift and basin subsidence is necessary in order to construct a comprehensive tectonic theory for this structural style. This study will examine the spatial and temporal characteristics of uplift and subsidence, in and adjacent to, the southern end of the Wind River Range, Wyoming, where unparalleled geometric information is available from the COCORP seismic studies and the synorogenic sedimentary record is relatively complete.

These investigations will utilize stratigraphic analysis and mapping in conjunction with petrologic and sedimentologic studies of unroofing sequences, petrofacies, sandstone architecture and pedogenic features in the synorogenic sediments. Information concerning source area uplift (petrologic studies) and basin stability (sedimentologic studies) will be integrated within the context of the Late Cretaceous and Tertiary time-stratigraphic framework in order to delineate the temporal and spatial character of the uplift-basin couple.

These observations will supply answers to specific questions regarding the relative motion, intermittency and duration of uplift and subsidence and thus provide constraints for the refinement of theories regarding mechanisms of foreland deformation.

Steidtmann, J.R., 1986, Eocene-Pliocene stratigraphy along the southern margin of the Wind River Range, Wyoming: revisions and implications from field and fission-track studies: Mountain Geologist, v. 23, p. 19-25.

Steidtmann, J.R., and Groll, P., 1986, Fluvial response to Eocene tectonism, the Bridger Formation, southern Wind River Range, Wyoming: submitted, Third International Fluvial Sedimentology volume.

Steidtmann, J.R., and Shuster, M.W., 1986, Fluvial-sandstone architecture and thrust induced subsidence, northern Green River Basin, Wyoming: submitted, Third International Fluvial Sedimentology volume.

Steidtmann, J.R., Middleton, L.T., Bottjer, R.J., Jackson, K.E., McGee, L.C., Southwell, E.H., and Lieblang, S., 1985, Geometry, distribution and prove-

nance of syntectonic conglomerates along the southern margin of the Wind River Range, Wyoming, *in* Peterson, J.A., editor, Paleotectonics and sedimentation in the Rocky Mountain Region, United States: American Association of Petroleum Geologists Memoir, in press.

130. Steidtmann, J.R., Origin of the Hanna Basin: study in progress.

The debate as to the nature of deformation in the Rocky Mountain foreland has, of late, resolved into one of vertical vs. horizontal tectonics, although wrench faulting is still considered as important by some. Understanding the tectonic development and sedimentary fill of the Hanna Basin may be a key to understanding this basement involved deformation. Because of its small size (2,600 square kilometers), great depth (16,000 meters relief on the Precambrian) and extremely thick Upper Cretaceous through Tertiary syntectonic sedimentary fill (6,000 meters), the Hanna Basin in southeastern Wyoming is unique. Whereas the author's ongoing research has shown that the Laramide Green River Basin most likely owes its origin to tectonic loading and consequent depression of the crust by the overriding Precambrian block, the tectonic setting of the Hanna Basin provides no obvious similar explanation for either its location or great depth.

Detailed analyses of the syntectonic sedimentary fill (chronostratigraphy, depositional environments, petrology, paleocurrents, provenance and sandstone architecture) and of the tectonic setting (structural relations within the basin and along the basin margin) will be conducted. In addition, fission-track dating of apatite as an indicator of basin subsidence and uplift will be used. This information will then be used as the basis for modeling the history of basin subsidence and identifying probable causal relations. Modeling techniques will include a backstripping procedure to determine depth to basement through time, present-basin geometry profiling which compares predicted basin configuration with present observed configuration and sediment-thickness profiling which relates stratigraphic thickness to coeval tectonic loading.

131. Taucher, S.E.G., The paleoecology of benthic foraminifera from the lower Hilliard Shale, Blazon Gap, Wyoming: M.S. thesis, in progress.

132. Williams, J.D., Depositional and provenance controls on diagenesis of sandstones associated with the Green River Formation of Wyoming: M.S. thesis, in progress.

133. Winslow, N.S., Timing and tectonic significance of Upper Jurassic and Lower Cretaceous nonmarine sediments, Bighorn Basin, Wyoming and Montana: M.S. thesis, in progress.

134. Winterfeld, G.F., Laramide tectonism, deposition and early Cenozoic stratigraphy of the northwestern Wind River Basin, Wyoming: PhD dissertation, in progress.

The study treats depositional environments, paleogeomorphology and mammalian vertebrate paleontology. Surface mapping, supplemented by well core data, confirms gravitational sliding as a structural element.

Washington D.C.
Smithsonian Institution

135. Emry, R.J., Vertebrate paleontology and mammalian biostratigraphy of the White River Group in central and eastern Wyoming: study in progress.

SUBJECT INDEX

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