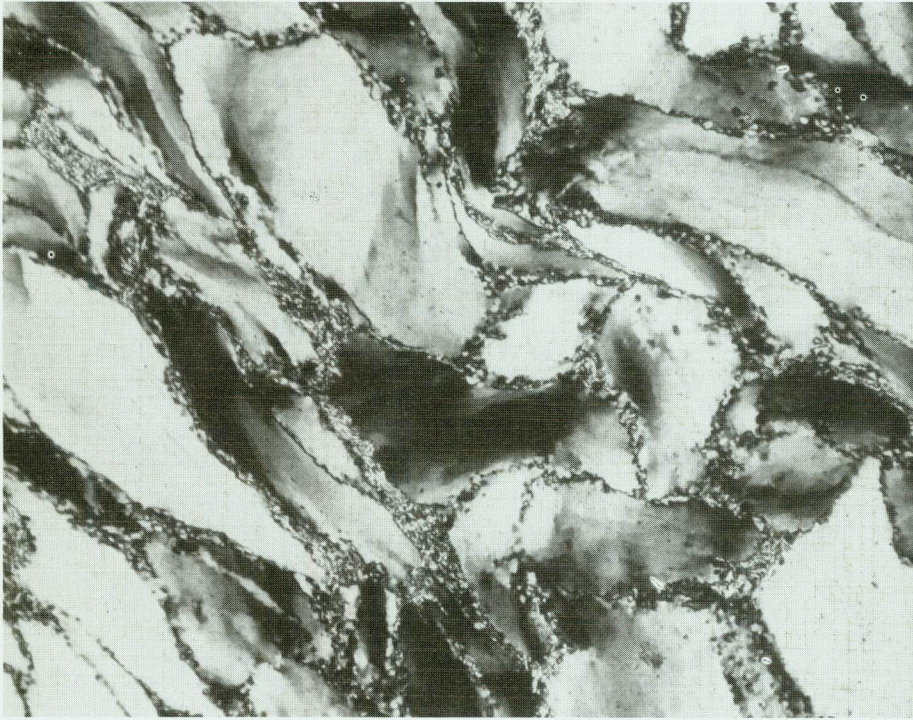


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**CURRENT GEOLOGICAL
AND GEOPHYSICAL
STUDIES IN
MONTANA**

compiled by
Richard B. Berg



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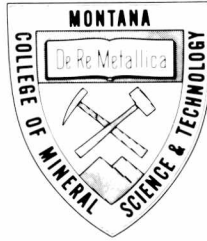
Precambrian protomylonite

Bulletin 116

1981

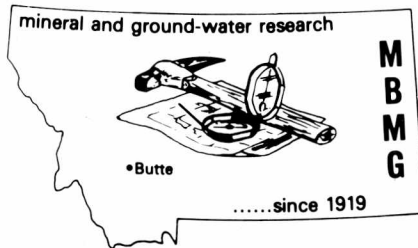
Montana Bureau of Mines and Geology
A Department of
Montana College of Mineral Science and Technology

Bulletin 116



**CURRENT GEOLOGICAL AND
GEOPHYSICAL STUDIES
IN MONTANA
1981**

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Richard B. Berg



1981

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Sheets

- 1—Index map of Montana (back pocket)
- 2—Index map of southwestern Montana (back pocket)

About the cover . . .

Protomylonite derived from Precambrian quartzite exposed in the Henrys Lake Mountains, approximately 36 km west of West Yellowstone, Montana.

Preface

This annual list of current geological and geophysical studies would not be possible without the assistance of those who took the time to send us information on their research. We appreciate this cooperation and hope that you will find this list useful.

Most studies are listed under one heading only, but because of the difficulty of assigning some studies to a single category, some are listed under more than one heading. The date following the entry is the expected date of completion. Many of the entries are numbered and plotted on the index maps. An asterisk [*] indicates that the area of study is plotted on the index map of southwestern Montana [**Sheet 2, back pocket**]. All other numbered entries are plotted on the index map of Montana [**Sheet 1, back pocket**].

Completed theses are not included in this compilation. For information on theses dealing with Montana geology, see Montana Bureau of Mines and Geology Special Publication 77 (1977). Northwest Geology, published annually by the Geology Department, University of Montana, is also an excellent source of information on theses dealing with the geology of Wyoming, Montana, Idaho, Oregon and Washington.

Many of the studies listed here are far from being completed. We suggest that anyone who wants more information on a specific project should correspond directly with the investigator.

Questionnaires for next year's list will be mailed out in January 1982. If you did not receive an inquiry this year but would like to be added to the mailing list, you can send in the request form at the back of this bulletin.

Richard B. Berg
Economic Geologist
Montana Bureau of Mines and Geology

Butte
April 10, 1981

Areal Geology

- Index to geologic maps of Montana by 1° x 2° quadrangles. Robert N. Bergantino
Montana Bureau of Mines
and Geology
- 1 Compilation of areal geology of the Forsyth, Kalispell and Miles City 1° x 2° quadrangles. [Late 1981 or early 1982.] Robert N. Bergantino
Montana Bureau of Mines
and Geology
- Statewide geologic atlas. As work is completed, 2° quadrangle maps will be published at a scale of 1:250,000. [Continuing.] Edward C. Bingler
Montana Bureau of Mines
and Geology
- 2 [See Environmental and Engineering Geology.] Edward C. Bingler and
Michael Stickney
- *3 Geology of the Polaris 15-minute quadrangle, Beaverhead County. Willard E. Cox
Montana Tech
- 4 Geology of the Birney 1° quadrangle. [Continuing.] William C. Culbertson
- *5 [See Structural Geology.] Dean P. Dubois
- 6 Geology of Glacier National Park. [1985.] Robert L. Earhart
USGS, Denver, Colorado
- *7 Petrology and structure of the pre-Belt rocks of the southern Madison Range. [1981.] Eric A. Erslev
Harvard University
- 8 Geology of the Kalispell 2° quadrangle. [1986.] Jack E. Harrison
USGS, Denver, Colorado
- 9 Geology and mineral resources of the Wallace 2° quadrangle (CUSMAP), Idaho and Montana. [1986.] Jack E. Harrison
USGS, Denver, Colorado
- 10 Geology of the Recluse 1° quadrangle. [Continuing.] Bion H. Kent
USGS, Denver, Colorado
- *11 Geology of part of the Precambrian basement on the eastern slope of the Gravelly Range. John C. Kleinschmidt
Montana Tech
- *12 [See Structural Geology.] David R. Lageson
- 13 Geology of the Birney 1° quadrangle (includes preparation of an engineering geologic map). [1982.] Robert M. Lindvall
USGS
- 14 Relation of geologic framework to uranium resources in the Sandpoint 2° quadrangle, Idaho and Montana. [1987.] Fred K. Miller
USGS
- 15 Geology of the White Sulphur Springs 2° quadrangle. [1985.] Mitchell W. Reynolds
USGS, Denver, Colorado
- *16 Geology of the Dillon 2° quadrangle, Idaho and Montana. [1982.] Edward T. Ruppel
USGS, Denver, Colorado

Areal geology (*continued*)

- | | |
|--|---|
| *17 [See Structural Geology.] | Robert Scholten |
| *18 Geology of the Dubois 2° quadrangle, Idaho and Montana. [1988.] | Betty Skipp
USGS, Denver, Colorado |
| 19 Compilation of Bozeman 1° x 2° geologic map. [Spring 1982.] | Don Smith
Montana State University |
| 20 Geologic mapping, geochemical and geophysical surveys of the eastern part of the Selway-Bitterroot Wilderness, Idaho and Montana. | Margo I. Toth
USGS, Denver, and
University of Colorado |
| 21 Geology of the Richey 1° quadrangle. [1982.] | Donald E. Trimble
USGS, Denver, Colorado |
| 22 Geology of the Forsyth 1° quadrangle. [1982.] | Donald E. Trimble
USGS, Denver, Colorado |
| *23 Geologic map of the southern Tobacco Root Mountains, Madison County. | Charles J. Vitaliano and
William S. Cordua, Indiana
University, Bloomington |
| 24 Geology of the Butte 2° quadrangle (CUSMAP). [1982.] | Chester A. Wallace
USGS, Denver, Colorado |
| *25 [See Structural Geology.] | E-an Zen |

Structural Geology/Tectonics

- | | |
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| 26 Geology and tectonic history of the northern Flint Creek Range, Granite and Powell counties. [Summer 1981.] | Jeffrey F. Baken
Montana State University |
| 27 [See Geophysics.] | William E. Bonini |
| 28 Tectonic study of the Wolf Creek area utilizing Landsat photography. [June 1983.] | Marcus Borengasser, Univer-
sity of Missouri, Columbia |
| *29 Palynological study of Colorado Group rocks involved in thrusting to determine time of thrusting. Sample sites located in sec. 26, T. 4 S., R. 8 W. [December 1981.] | David S. Brumbaugh
Northern Arizona University |
| 30 [See Isotope Geology and Geochronology.] | Ronald B. Chase |
| 31 [See Geochemistry, Mineralogy and Petrology.] | Neal R. Desmarais |
| *5 Geology and structure of the northern Tendoy Range, Beaverhead County. | Dean P. Dubois, Pennsyl-
vania State University |
| Structure contours on the top of the Madison Limestone are being compiled on 1° x 2° quadrangles throughout Montana. Several quads have been published and four are under way this year. [September 1983.] | Richard Feltis, USGS
Water Resources Division,
Billings, Montana |

Structural geology/tectonics (*continued*)

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| <p>Compilation and synthesis of Archean geology of southwestern Montana. [June 1981.]</p> | <p>David Fountain
University of Montana.</p> |
| <p>Early Tertiary magmatic patterns in Montana, Wyoming and Idaho. [June 1981.]</p> | <p>David Fountain
University of Montana</p> |
| <p>*32 Study of recurrent (Precambrian, Laramide and post-Laramide) fault motions along northwest-trending faults in the Ruby, Highland, Tobacco Root and Madison ranges and adjoining basins. [1982.]</p> | <p>John M. Garihan, Furman University; Christopher J. Schmidt, Western Michigan University</p> |
| <p>*33 Structural interpretation of the southern Tendoy thrust, southern Beaverhead County (Lima Peaks, Gallagher Gulch and Snowline quadrangles).</p> | <p>Phil Hammons
Texas A and M University</p> |
| <p>34 Petrographic and structural analysis of the foliated metamorphic rocks exposed in Chaffin Creek Canyon, Bitterroot Range. [1981.]</p> | <p>Jon Heeman, Western Michigan University</p> |
| <p>Neotectonic analysis of southern Montana east of 112° 30' longitude.</p> | <p>Willis M. Johns and others
Montana Bureau of Mines and Geology</p> |
| <p>*12 Structural analysis and surface geologic mapping in the Medicine Lodge thrust system of southwestern Montana and adjacent parts of Idaho. This project involves both detailed surface mapping and regional tectonic relations in the Tendoy, Beaverhead, Lemhi and Pioneer mountains. [Continuing.]</p> | <p>David R. Lageson
Montana State University</p> |
| <p>*35 Cataclastic deformation associated with thrust faults in the Medicine Lodge thrust system of southwestern Montana and adjacent parts of Idaho. This research addresses important aspects of brecciation and sliding relevant to the mechanics of thrust faulting. Field locations are in the Beaverhead and Lemhi ranges. [June 1982.]</p> | <p>David R. Lageson
Montana State University</p> |
| <p>36 Geology along the Beartooth highway, Gardiner Lake to Cooke City; a continuous strip map of Archean rocks and structures. [1983-1984.]</p> | <p>Leonard H. Larsen
University of Cincinnati</p> |
| <p>37 Geology and petrology of the Hell Roaring Lakes area, Beartooth Mountains. Large-scale mapping of Archean metasedimentary rocks; petrology, chemistry and structural analysis of polymetamorphic high-grade terrane. [1981-1982.]</p> | <p>Leonard H. Larsen, University of Cincinnati; Lawrence C. Rowan, USGS, Reston, Virginia</p> |
| <p>[See Stratigraphy.]</p> | <p>Alan McBean</p> |
| <p>38 Continuing research on the extent and characteristics of glacial phenomena and Quaternary tectonic features of the Yellowstone Valley south of Livingston, and the Madison Valley north of Reynolds Pass. [1984.]</p> | <p>John Montagne
Montana State University</p> |

Structural geology/tectonics (*continued*)

- [See Environmental and Engineering Geology.] David Nash
- 39 Sequence of thrusting in northwestern Montana. Timothy Reed
[May 1981.] Purdue University
- A regional study of northwest-trending basement faults and associated structures of the Rocky Mountain foreland, Montana. [1983.] Christopher Schmidt, Western Michigan University; John Garihan, Furman University
- A study of structural controls for Cenozoic basin-range faulting in southwestern Montana. [1983.] Christopher Schmidt Western Michigan University
- *40 Structure of the Medicine Lodge thrust sheet, Robert Scholten, Pennsylvania State University
Beaverhead County.
- *17 Geology and structure of the Horse Prairie basin and surrounding mountains, Beaverhead County. Robert Scholten, Pennsylvania State University
- Tectonic evolution of southwestern Montana, especially as reflected in the sedimentary record. [Continuing.] W. Thomas Straw, Western Michigan University
- *41 Geologic structure of the Bannack to Argenta area, southwestern Montana. [May 1981.] Jed Thomas University of Montana
- *42 Cataclastic deformation association with major thrust faults in southwestern Montana. Ann M. Vasko Montana State University
[June 1982.]
- Relationship between thrust faults involving basement rocks and those involving Paleozoic rocks. Also work on the stratigraphy of the Madison Group. Nancy S. Williams, University of North Carolina at Chapel Hill
- *43 Structure and stratigraphy of the eastern flank of the Tendoy Range, southwestern Montana. Nancy S. Williams, University of North Carolina at Chapel Hill
[Summer 1982.]
- 44 A study of Laramide and Recent tectonic activity along the Gardiner Fault, northwest of Gardiner. M. Arthur Williams Western Michigan University
[Spring 1982.]
- *45 Laramide and late Cenozoic structural history and mechanics of basement faulting in the Jack Creek basin area, northern Madison Range. Susan L. Wygant Western Michigan University
[Spring 1982.]
- *25 Tectonic framework of the Pioneer Mountains. E-an Zen USGS, Reston, Virginia
[Continuing.]

Stratigraphy, Sedimentary Petrology and Paleontology

- Study of the morphology of the sub-Cretaceous unconformity in south-central Alberta. Will include facies analysis and geophysical properties of the strata immediately above the unconformity. William C. Barnes, University of British Columbia

Statigraphy, sedimentary petrology and paleontology (*continued*)

- 46 Evolutionary, functional and stratigraphic relationships of proscalopine moles from the Miocene Deep River Formation, Meagher County. [1981.]
Anthony D. Barnosky
University of Washington
- Correlation of unusually thick Miocene deposits in Jackson Hole, Wyoming, with isolated exposures in west-central Montana. [1983.]
Anthony D. Barnosky
University of Washington
- 47 Stratigraphy and depositional setting of the Judith River Formation (Cretaceous) on the Fort Belknap Indian Reservation, with special emphasis on coal of the area. [Fall 1982.]
Roger E. Braun
Montana State University
- Chronostratigraphy of mid-Cretaceous hydrocarbon source rocks, western interior. [1982.]
William A. Cobban
USGS, Denver, Colorado
- 48 The Anderson-Dietz coal zone, Rosebud, Powder River and Big Horn counties (includes the depositional history, resources, evaluation and preparation of cross sections). [July 1981.]
Gary A. Cole
Montana Bureau of Mines and Geology
- 49 Stratigraphy, sedimentation and tectonic history of the Kishenehn Formation, Flathead County. [May 1981.]
Kurt Constenius
University of Wyoming
- Tertiary geology and uranium occurrences of the Powder River basin. [1983.]
Norman Denson
USGS, Denver, Colorado
- Stratigraphic analysis of western interior Cretaceous uranium basins. Includes study of the Hell Creek and Fox Hills formations and the Eagle Sandstone in Montana. [Continuing.]
Harry W. Dodge, Jr.
USGS, Denver, Colorado
- *50 Stratigraphy, biostratigraphy, sedimentation and structure, Muddy Creek basin, Beaverhead County. [December 1981.]
Dennis G. Dunlap
University of Montana
- Stratigraphy, sedimentation and paleontology of the Tertiary basins of southwestern Montana and eastern Idaho.
Robert W. Fields
University of Montana
- 51 Plant remains, detailed stratigraphy and sedimentology of the Middle Eocene Sepulcher Formation in northwestern Yellowstone National Park and vicinity ("Gallatin petrified forests") are being studied to provide a better paleoenvironmental reconstruction. [1982?]
Lanny H. Fisk
Michigan State University
- 52 Depositional environments and provenance of arkosic sandstone and conglomerate in the Park Shale (Middle Cambrian) in the Bridger Range and Horseshoe Hills area. [November 1981.]
Jenny Fryxell
Montana State University

Stratigraphy, sedimentary petrology and paleontology (*continued*)

- Biostratigraphy, paleobiogeography and taxonomy of Cretaceous and early Tertiary nonmarine Mollusca in Montana and elsewhere in the western interior of North America; presently concentrating on the Viviparidae from the Campanian to the early Eocene. Joseph H. Hartman
University of Minnesota
- 53 Regional correlation and interpretation of upper Jurassic and lower Cretaceous stratigraphy in north-central Montana, extending into southeastern Alberta. [November 1981.] Brad J. Hayes
University of Alberta
- 54 Flora and stratigraphy of the Fort Union Formation (Paleocene) of the Big Horn basin. [1983.] Leo J. Hickey, Smithsonian Institution; Erling Dorf, Princeton University
- 55 Paleontological investigation of Mississippian age soft-bodied fauna of Bear Gulch Limestone, Fergus County. Douglas S. Jones
University of Florida
- Petrology, paleotectonics and sedimentation of Precambrian Y sedimentary rocks, east-central Idaho and southwestern Montana. Alan McBean, Pennsylvania State University
- Gas-bearing strata of mid-Cretaceous age in western Wyoming and adjacent areas. E. A. Merewether
USGS, Denver, Colorado
- *56 Petrology of the Bozeman Group, Madison County. Stewart Monroe
Central Michigan University
- 57 Geochemical and sedimentological study of Flathead Lake sediments; also sub-bottom profiling of Flathead Lake. [1982.] J. Moore
University of Montana
- Paleocene time scale for the Rocky Mountain region, USA. (Includes data from several localities in eastern and southern Montana.) [1982.] Karl R. Newman
Colorado School of Mines
- Biostratigraphy and depositional environments, Tertiary nonmarine basins, Rocky Mountains foreland. [1985.] Douglas J. Nichols
USGS, Denver, Colorado
- Depositional history and petroleum geology of the Minnelusa Formation. [1982.] R. T. Ryder
USGS, Denver, Colorado
- Stratigraphic framework and facies analysis of the Mississippian system, western North America. [Continuing.] William J. Sando, USGS and U.S. National Museum, Washington, D.C.
- *58 Stratigraphic analysis and modeling—Tertiary basins of western Montana (initially Medicine Lodge-Horse Prairie and Three Forks basins). [1985.] Gary B. Schneider
USGS, Denver, Colorado

Stratigraphy, sedimentary petrology and paleontology (*continued*)

- Depositional environments and diagenesis of the Flathead Quartzite (Middle Cambrian) and the Flathead-Wolsey transitional strata in southwestern Montana. [December 1981.] Jay N. Shearer
Indiana University
- Sedimentology of selected areas of the Knobloch, Dietz and Anderson coal beds and associated rocks in southeastern Montana. [September 1981.] Mark A. Sholes
Montana Bureau of Mines and Geology
- 59 Stratigraphy with special emphasis on coal distribution and resources, and geologic mapping in the Baker and Wibaux 1:100,000 quadrangles of eastern Montana. Mark A. Sholes
Montana Bureau of Mines and Geology
- Sedimentology and stratigraphy of the Madison Limestone, central and south-central Montana: Development of shelf to basin model, including eustacy, epeirogenesis, local paleostructural elements and rates of carbonate production. [Spring 1982.] Don Smith
Montana State University
- Tectonic influences on Cretaceous sediment-dispersal patterns in southwestern Montana. [May 1982.] Lee J. Suttner and Peter DeCelles, Indiana University—Bloomington
- *60 Cenozoic geology of a portion of the Red Rock Hills and Sage Creek basin, Beaverhead County. Emphasis is on Eocene and Oligocene stratigraphy and mammalian paleontology. [Summer 1981.] Alan R. Tabrum
University of Montana
- Tertiary paleoclimatology, sedimentation patterns and uranium distribution, southwestern Montana. Gray Thompson
University of Montana
- *61 Study of the depositional environments of the Thermopolis, Muddy and Mowry formations, southern Madison and Gallatin ranges. Includes a study of palynomorphs. [March 1981.] Susan Vuke
University of Montana
- Biostratigraphy, organic metamorphism, upper Paleozoic and Triassic rocks, overthrust belt, west-United States. [1982.] Bruce R. Wardlaw
USGS, Denver, Colorado
- Mississippian crinoids of central and western Montana. [Continuing.] G. D. Webster
Washington State University
- 62 Sedimentology of the Altyn Formation (Precambrian) of Glacier National Park. Emphasis is on shallowing-upward cycles, stromatolites, micro-biotas and evaporitic carbonates. [Summer 1982.] Brian White
Smith College
- [See Structural Geology.] Nancy S. Williams
- *43 [See Structural Geology.] Nancy S. Williams
- Stratigraphy and sedimentation of Belt units, northwestern Montana and northern Idaho. Don Winston
University of Montana

Stratigraphy, sedimentary petrology and paleontology (*continued*)

- 63 Correlation of the upper Newland Formation (Precambrian) in the northern and central Helena embayment of the Precambrian Belt basin. [May 1981.] Gerald A. Zieg
University of Montana

Geochemistry, Mineralogy and Petrology

- 64 Petrology of intrusive rocks in the northern Judith Mountains. [March 1981.] Paula Barrick
Montana State University
- Tertiary volcanic rocks of southwestern Montana. [Continuing.] Robert A. Chadwick
Montana State University
- 30 [See Isotope Geology.] Ronald B. Chase
- 65 Petrology of the Yellowstone Plateau volcanic field. [Continuing.] Robert L. Christiansen,
USGS, Menlo Park, California
- Mineralogical studies of quartzites from the Spokane Formation. [Continuing.] Jon J. Connor
USGS, Denver, Colorado
- Geochemistry of pyrite in the Mammoth coal seam, eastern Montana. John Daniel and Frank Diebold, Montana Tech
- 31 Petrology, geochemistry and tectonic framework of the Chief Joseph plutonic complex, Idaho-Montana. Map areas include sections north and south of the East Fork of the Bitterroot River and in the Lost Trail Pass area. Neal R. Desmarais
University of Washington
- Metal geochemistry of the Rosebud coal seam, eastern Montana. Frank Diebold, Dave Dobb and Bill Christiaens
Montana Tech
- Evaluation of flyash as a tailings-pond amendment to neutralize sulfide tailings, fix metals and reduce seepage losses. [December 1981.] J. J. Donovan, John L. Sonderegger, Montana Bureau of Mines and Geology
- Evaluation of leachable salt loads, sources of selenium and its transport mechanism(s) in saline-seep affected areas of Montana. [1981.] J. J. Donovan, John L. Sonderegger, M. R. Miller, Montana Bureau of Mines and Geology
- [See Energy.] Terrence J. Donovan
- 66 [See Economic Geology.] Lawrence J. Drew
- 67 Reconnaissance study of orbicular granites in the Beartooth Mountains. [1983.] George W. Fisher
Johns Hopkins University
- [See Structural Geology.] David Fountain
- Geochemistry and origin of Archean quartzofeldspathic gneisses in southwestern Montana. [June 1981.] David Fountain
University of Montana
- 68 Geochemical constraints on the origin of Proterozoic anorthosites, western United States (includes Bitterroot anorthosite, Montana). [1982.] Steven A. Goldberg
University of Oregon

Geochemistry, mineralogy and petrology (*continued*)

- Petrology and geochemistry of the Phosphoria Formation. [Continuing.] Robert A. Gulbrandsen
USGS, Menlo Park, California
- 69 Geology of the Slough Creek Tuff and the Ash Mountain area, Park County. [Continuing.] James T. Gutmann
Wesleyan University
- *70 Structural relations of metabasites in the north-west and southern Tobacco Root Mountains, Madison County. [1982.] Thomas B. Hanley
Columbus College
- *71 Mineral chemistry of some garnet pyroblastite metabasites from the Tobacco Root Mountains, Madison County. [1983?] Thomas B. Hanley, Columbus
College; Peter Dahl, Kent
State University
[See Energy.] Dick Hannifan, Dennis Jenke,
Don Beuerman
- 72 Uranium geochemistry of hydrothermal solutions in the Bearmouth area. [June 1981.] B. Patrick Heald
Montana Tech
- 73 Geology of kimberlites (includes work in north-central Montana.) [Continuing.] B. Carter Hearn, Jr.
USGS, Reston, Virginia
Geochemistry of clinker. [Continuing.] James R. Herring
USGS, Denver, Colorado
- *74 Study of the mineralogy of amphibolites and metamorphic facies of rocks in the Tobacco Root Mountains and adjoining areas. Also microprobe analyses of pyroxene-garnet pairs and areal synthesis of facies in the region. [1982 or 1983.] David F. Hess
Western Illinois University
Geochemical survey of Cretaceous rocks overlying minable coal in the western United States. [Continuing.] Todd K. Hinkley
USGS, Denver, Colorado
- 75 Petrology, chemistry and tectonics of the Bitterroot lobe of the Idaho batholith. Donald Hyndman
University of Montana
Geochemistry of F, Cl, P and S in the Rosebud coal seam, eastern Montana. Margaret Ikeda and Frank
Diebold, Montana Tech
Chemical modeling and characterization of The Anaconda Company's mine-waste disposal system and investigation of techniques for metal recovery. Dennis Jenke, Frank Diebold,
Montana Tech; Gordon
Pagenkopf, Montana State
University
- 76 Petrochemistry and petrology (including a detailed geologic map) of the Rocky Boy stock in the Bearpaw Mountains. [September 1981.] Mark W. Joop
Washington State University
- 77 Continued geologic mapping of igneous bodies of Crazy Mountains; Coffin Butte and Little Elk dome in the northern part are targeted. [1982-1983.] Leonard H. Larsen
University of Cincinnati
- 36 [See Structural Geology.] Leonard H. Larsen
- 37 [See Structural Geology.] Leonard H. Larsen and
Lawrence C. Rowan

Geochemistry, mineralogy and petrology (*continued*)

- *78 Mapping, geochemical sampling and fission track age-dating of numerous Tertiary volcanic deposits in Sage and Blacktail creeks, Beaverhead and Madison counties. [June 1983.]
 [See Energy.]
 Correlation of chemical and mineralogical variation in the Fort Union Formation with environment of deposition. [Continuing.]
- Kim L. Marcus
Western Washington University
- Steve McGrath, Frank Diebold
- James M. McNeal
USGS, Denver, Colorado
- 79 Petrology, structure and geochemistry of Archean rocks in the North Snowy Block, Beartooth Mountains.
- David W. Mogk
University of Washington
- 80 Geochemical and isotopic investigation of the Precambrian rocks of the Beartooth Mountains, with emphasis on U and Th distribution and geochemistry.
- Paul A. Mueller
University of Florida
- 81 A comparative study of "Leopard Rock" dikes and an ellipsoidal amphibolite in the Beartooth Mountains. [1985.]
- John C. Palmquist
Lawrence University
- *82 Mapping, petrology and geochemistry of the volcanic rocks at Black Butte, Madison County. [Winter 1981-1982.]
- Paul Pushkar, Wright State University;
James Gutman, Wesleyan University
- 83 Study includes detailed modal and chemical variations of silicate minerals in select stratigraphic sections through the Stillwater Complex. The ultimate goal is to determine the petrogenesis of the intrusion or at least the major processes involved in its crystallization history. [Continuing.]
- L. D. Raedeke and
I. S. McCallum
University of Washington
- 57 [See Stratigraphy.]
- J. Moore
- 84 [See Economic Geology.]
- Paul D. Proctor
- 85 Mineralogical study of mixed-layer illite-smectite in shales from the Montana disturbed belt.
- Leonard G. Schultz
USGS, Denver, Colorado
- 86 Sr isotope systematics, major elements and trace-element chemistry of granitic rocks, inclusions and country rocks from the northeast border zone of the Idaho batholith. [Spring 1982.]
- Robert D. Shuster
University of Kansas
- Investigation of lithic materials in archaeological context: Studies in cooperation of Montana State University archaeologists. [Continuing.]
- Don Smith
Montana State University
- [See Energy.]
- Tim Snelling, Doug Drew,
Frank Diebold
- *87 Petrogenesis of a mafic sill swarm; Doherty Mountain area. [1983.]
- Charles J. Vitaliano and
T. S. Hamilton
Indiana University

Geochemistry, mineralogy and petrology (*continued*)

- *88 Petrology and geochemistry of the Tobacco Root batholith. Charles J. Vitaliano, Indiana University; D. F. Hess, J. L. Smith and others, Western Illinois University
[See Stratigraphy.] Bruce R. Wardlaw
- *89 Mineralogy, petrology and geochemistry of eight stocks in the Pioneer Range, Beaverhead County. [Summer 1981.] John Welch
Purdue University
Study of ultramafic xenoliths in basaltic rocks (includes work in Montana). [Continuing.] Howard G. Wilshire
USGS
- *90 Petrology and origin of Archean assemblages exposed at Copper Mountain, southern Tobacco Roots, and the Kelly area, northern Ruby Range, southwestern Montana. Michael L. Wilson
University of Montana
- *91 Petrologic study is made of the Archean high-grade metamorphic rocks exposed in the core of the Armstead anticline of southwestern Montana. This area borders the north side of the Clark Canyon Reservoir and extends six miles northward. [May 1981.] Maria Young
University of Montana

Isotope Geology and Geochronology

- 30 Origin, structural evolution and age of the north-eastern Idaho batholith igneous-metamorphic complex. This is a continuing study which involves mapping, petrography, structural analysis, U-Pb and Rb-Sr isotopic dating of the Bitterroot gneiss dome and surrounding region. Ronald B. Chase
Western Michigan University
[See Geomorphology.] Donald A. Coates
Compilation of radiometric dates of Montana rocks. (Will be published as MBMG Bulletin 114, and will be available in late summer 1981.) Faith Daniel and Richard B. Berg, Montana Bureau of Mines and Geology
- *92 Lead isotope studies in conjunction with study of geology of Dillon 2° quadrangle. Bruce R. Doe
USGS, Denver, Colorado
- 93 Operation of an automated helium sniffer near Gardiner. Irving Friedman
USGS, Denver, Colorado
- *78 [See Geochemistry.] Kim L. Marcus
Existing data in Radiometric Age Data Bank for Montana will be revised and updated. Richard F. Marvin
USGS, Denver, Colorado
- 80 [See Geochemistry.] Paul A. Mueller
- 94 Study of the time of thrusting of the Sapphire tectonic block. Charles W. Naeser
USGS, Denver, Colorado

Isotope geology and geochronology (*continued*)

- | | |
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| Chemical and isotopic evidence of the origins of natural gases. [1983.] | Dudley D. Rice
USGS, Denver, Colorado |
| 95 Stable isotope study of the ore at Blacktail Mountain. | Robert O. Rye
USGS, Denver, Colorado |
| 86 [See Geochemistry.] | Robert D. Shuster |
| *96 Sr isotopic study of the Pioneer batholith. [Continuing.] | Thomas W. Stearn
USGS, Reston, Virginia |

Geophysics

- | | |
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| Stratigraphic geophysical data analysis. Data processing and interpretation of reflection—seismic data and well-log data will include data from the Powder River basin. The use of the data as an exploration tool for deep aquifers will be evaluated. | Robert C. Anderson
USGS |
| Seismic interpretations of stratigraphic oil and gas traps. Will include a seismic profile in the eastern part of the Powder River basin. [1981.] | Alfred H. Balch
USGS, Denver, Colorado |
| Seismic monitoring and regional seismicity of Montana—in cooperation with the University of Montana. | Edward C. Bingler, Michael
Stickney, Montana Bureau
of Mines and Geology |
| 27 Detailed gravity study of Beartooth Front, near Red Lodge, to investigate structure and nature of the thrusting. | William E. Bonini
Princeton University |
| Studies of the magnetic polarity stratigraphy of the Fort Union and Wasatch formations of the northern Powder River basin. [Continuing.] | Donald P. Elston
USGS, Flagstaff, Arizona |
| Precambrian magnetic chronology (includes work on rocks of the Belt Supergroup in western Montana). [Continuing.] | Donald P. Elston
USGS, Flagstaff, Arizona |
| 97 Geophysics of the Purcell anticlinorium. [June 1982.] | David Fountain
University of Montana |
| 98 Gravity and aeromagnetic data will be collected for selected areas within the Butte 2° quadrangle. [1982.] | William F. Hanna
USGS, Denver, Colorado |
| *99 [See Geomorphology and Glacial Geology.] | Peter P. Johnson |
| Geophysical studies of the overthrust belt, northern Rocky Mountains. [1985.] | M. Dean Kleinkopf
USGS, Golden, Colorado |
| Magnetic, gravity and electrical surveys in conjunction with USGS work in western Montana. [Continuing.] | M. Dean Kleinkopf
USGS, Denver, Colorado |

Geophysics (*continued*)

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| 100 Sub-bottom profiling of Flathead Lake. This study has shown a variety of deformational structures in the upper 200 ft. of lake sediments covered by a drape of undisturbed sediments 10 to 30 ft. thick. [June 1981.] | Jerry Kogan
University of Montana |
| Delineation of the Montana mineral belt by satellite and geophysical remote sensors. [May 1982.] | David M. L'Heureux
Purdue University |
| 101 Yellowstone seismic analysis. [Continuing.] | A. M. Pitt, USGS |
| *102 Surface gravity and magnetic measurements of the 10 N pluton, southern Broadwater County. [August 1981.] | Charles Rinehart, Indiana University, Bloomington |
| Crustal strain studies along some major faults in the western states, including Montana. [Continuing.] | James C. Savage
USGS |
| Gravity, magnetic, resistivity and seismic studies at certain geothermal areas in Montana. | Charles J. Wideman, Douglas W. Dresser, James W. Halvorson, Montana Tech |
| 103 Correlation of a total field (proton precession) ground magnetic survey with detailed geologic mapping in order to develop a computer model for the geometry of the quartz monzonite garnet stock. [June 1982.] | Kurtis Wilkie
Iowa State University |
| 104 Glacier National Park gravity studies. [1983.] | Dolores M. Wilson
USGS, Denver, Colorado |

Economic Geology

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| 105 Geochemical exploration in the Butte 2° quadrangle. [1982.] | John C. Antweiler
USGS, Denver, Colorado |
| Geology of barite deposits in Montana. [1982.] | Richard B. Berg, Montana Bureau of Mines and Geology |
| 66 Geostatistical analysis of the internal structure and spatial distribution of ore deposits in early magmatic environments. Study will be on the Stillwater Complex. [1982.] | Lawrence J. Drew
USGS, Reston, Virginia |
| 106 Mineral resources of the Butte 2° quadrangle (CUSMAP). [1983.] | James E. Elliott
USGS, Denver, Colorado |
| 107 Mineral resource evaluation of the Anaconda-Pintlar Wilderness area. [1982.] | James E. Elliott
USGS, Denver, Colorado |
| Titanium resources of the United States. [Continuing.] | Eric Force
USGS, Reston, Virginia |
| Study of selected talc deposits in southwestern Montana. | Steve Groening
Montana Tech |

Economic geology (*continued*)

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| 9 [See Areal Geology.] | Jack E. Harrison |
| Compile a map of the sodium (swelling) bentonite resources for conterminous United States. (Includes work in Montana.) [1982.] | John W. Hosterman
USGS, Reston, Virginia |
| Rocky Mountain fossil marine placers. | R. S. Houston, USGS |
| *108 Bedded Precambrian iron deposits of the Ruby Range. | Harold L. James
USGS |
| 109 Geochemical exploration in the Wallace 2° quadrangle. | David L. Leach
USGS, Denver, Colorado |
| [See Geophysics.] | David M. L'Heureux |
| 110 Study of igneous rocks and mineralized breccias, Moccasin Mountains. | David A. Lindsey
USGS, Denver, Colorado |
| 111 Geology of chromium. Includes study of small bodies of chromite—rich ultramafic rocks northwest and southeast of the Stillwater Complex. [Continuing.] | Bruce R. Lipin
USGS, Reston, Virginia |
| 112 Mineral resources of the Blue Joint Wilderness study area, Montana and Idaho. | Karen I. Lund, USGS, Denver
and University of Colorado |
| *113 Geochemical exploration, Tobacco Root Mountains. [1982.] | Henry McClernan, Montana
Bureau of Mines and Geology |
| 114 Metallic mineral deposits, Lewis and Clark County. [1981.] | Henry McClernan, Montana
Bureau of Mines and Geology |
| *115 Metallogenic map of the Dillon 1° x 2° quadrangle. [1981.] | Henry McClernan, Montana
Bureau of Mines and Geology |
| *116 Geochemical exploration, Rochester district. | Henry McClernan, Don C.
Lawson, Montana Bureau of
Mines and Geology |
| *117 Mineral resources of the Dillon 2° quadrangle (CUSMAP). [1984.] | Robert C. Pearson
USGS, Denver, Colorado |
| 84 Soil and stream sediment geochemical survey and computer data analysis, Bearpaw Mountains, Blaine County. [June 1981.] | Paul D. Proctor
University of Missouri, Rolla |
| 118 Platinum resources of the Stillwater Complex. [Continuing.] | Kenneth Segerstrom
USGS, Denver, Colorado |
| *119 Mineral resources of the Madison-Gallatin Wilderness. [1983.] | Frank S. Simons
USGS, Denver, Colorado |
| *120 Mineral resource potential of the Italian Peak Wilderness study area, Montana and Idaho. [1981.] | Betty Skipp
USGS, Denver, Colorado |
| 121 Mineral resource potential of the Mt. Henry area, Lincoln County. [1983.] | Richard E. Van Loenen
USGS, Denver, Colorado |

Economic geology (*continued*)

- 122 Mineral resources inventory of the Fort Belknap Indian Reservation. [September 1981.] John P. Wehrenberg
University of Montana
- Nonfuel mineral resources of Montana. Data from a variety of sources will be analyzed to identify metallogenic entities relevant to exploration and to define areas of mineral resource potential. [Continuing.] John D. Wells
USGS, Denver, Colorado
- 123 Mineral resource potential of the Ten Lakes area. [1983.] James W. Whipple
USGS, Denver, Colorado
- *124 Ore deposits, Virginia City area, southwestern Montana. Kenneth L. Wier
USGS

Energy

- 125 Coal resources of the Fort Peck Indian Reservation. [Continuing.] Harold H. Arndt
- [See Geophysics.] Alfred H. Balch
- 126 Geology and coal resources of the Hodges area, Dawson and Wibaux counties, eastern Montana. (To be released as an open-file report.) Arthur C. Banet, Jr.
USGS, Billings, Montana
- 127 Tract delineation and Logical Mining Unit selection for the West Glendive area of the Redwater-Golden Valley Management Framework Plan-BLM 1983 Coal Leasing objective. Arthur C. Banet, Jr.
USGS, Billings, Montana
- 128 Geology and coal resources of the Carlyle area, Fallon and Wibaux counties, eastern Montana. (To be released as an open-file report.) Arthur C. Banet, Jr.
USGS, Billings, Montana
- 129 Geology and coal resources of the southern Fallon Creek area, Carter and Fallon counties, eastern Montana. (This will be an addition to the Lame Jones Known Recoverable Coal Resource Area.) Arthur C. Banet, Jr.
USGS, Billings, Montana
- 130 Geology and coal resources of the Ismay-Plevna area, Fallon County, eastern Montana. (To be released as an open-file report.) Arthur C. Banet, Jr.
USGS, Billings, Montana
- 131 Compilation of bedrock geology, coal resources and surficial geology of the Poverty Flats East, Poverty Flats West, Pleasantview, Stipek and Fallon NE 7½-minute quadrangles. Arthur C. Banet, Jr., USGS,
Billings, Montana, and
Richard E. Eggleton, USGS,
Denver, Colorado
- *132 Geology and geothermal potential of the Jackson Hot Spring area, Big Hole valley. [1982.] Geoffrey A. Black
Montana State University
- 47 [See Stratigraphy.] Roger E. Braun

Energy (*continued*)

- Investigations of geothermal potential in south-western Montana, emphasizing geological investigations of hot spring districts. [Continuing.]
- 133 [See Hydrogeology.]
- [See Environmental.]
- Geochemistry of sedimentary organic matter, crude oil and natural gas. Will include a report on the hydrocarbon generation and oil and gas potential of the northern Montana disturbed belt. [Continuing.]
- [See Stratigraphy.]
- Compilation of information on oil and gas drilling and coal production in Montana. [Continuing.]
- 134 Oil shale potential of the Heath and Tyler formations, central Montana. [May 1981.]
- 48 [See Stratigraphy.]
- 135 Coal, petrography and mineralogic composition of the Anderson, Dietz, Canyon and Knobloch coals, southeastern Montana. [Continuing.]
- 136 Coal petrography, mineralogy and a study of coalification of coal in the Bull Mountain coal field, central Montana. [Continuing.]
- [See Geochemistry.]
- [See Stratigraphy.]
- [See Geochemistry.]
- [See Stratigraphy.]
- 137 Investigation of geothermal potential in the Little Bitterroot valley near Camas, Sanders County. [September 1981.]
- Evaluation and development of biogeochemical prospecting techniques for petroleum, utilizing plant macro species. Includes work in Montana. [1983.]
- A collection and compilation of Montana coal resources data for entry in the National Coal Resources Data System (NCRDS) computer, with future computer-derived plots, maps and reserve calculations for selected 7½-minute quadrangles. [Continuing.]
- Robert A. Chadwick
Montana State University
- Robert A. Chadwick and
Donald L. Smith
- Alan F. Chleborad
- Jerry L. Clayton
USGS, Denver, Colorado
- William A. Cobban
- Gary A. Cole, Montana Bureau of Mines and Geology
- Gary A. Cole, Montana Bureau of Mines and Geology
- Gary A. Cole
- Gary A. Cole, John A. Daniel,
Montana Bureau of Mines and Geology
- Gary A. Cole, John A. Daniel,
Montana Bureau of Mines and Geology
- John Daniel, Frank Diebold
- Norman Denson
- Frank Diebold, Dave Dobb,
Bill Christiaens
- Harry W. Dodge, Jr.
- J. J. Donovan, John L. Sonderegger, Montana Bureau of Mines and Geology; Charles J. Wideman, Montana Tech
- Terrence J. Donovan
USGS, Flagstaff, Arizona
- David E. Fine, Montana Bureau of Mines and Geology

Energy (*continued*)

- Environments of coal deposition in the U.S. western interior coal basins. [Continuing.]
 Tertiary oil basins of the western United States. [1983.]
- 138 Elemental composition of native plants from the vicinity of several coal-fired generating facilities, including the Colstrip powerplants. [1982.]
 Investigation of the moisture and other volatiles in Rosebud coal.
- 72 [See Geochemistry.]
 [See Geochemistry.]
 [See Geochemistry.]
 Exploratory coal drilling, coring and geophysical logging. [Continuing.]
 [See Geochemistry.]
 Research on geologic analysis of selected coal model areas. [Continuing.]
 [See Geochemistry.]
- 139 Coal resources of the Blackfoot Indian Reservation. [Continuing.]
- 140 Coal resources of the Crow Indian Reservation. [1981.]
- 141 Preliminary stratigraphic investigation of Fort Union (Paleocene) coal seams within the Glendive 1° x 2° quadrangle. [1981.]
 Fort Union coal characteristics: Collection, evaluation, characterization and integration of new data on the coal beds of the Fort Union region of eastern Montana and surrounding areas.
- 142 Coal resources of the Broadus 1° quadrangle. [1984.]
 Laboratory study of the effect of ground-water chemistry on the uranium concentration of Great Basin, Big Sagebrush and Black Greasewood. [1982.]
 [See Stratigraphy.]
 A computer program that locates epicenters of microseisms in burning coal mines will be applied to sites in the Powder River basin. [Continuing.]
- Romeo M. Flores
 USGS, Denver, Colorado
- Thomas D. Fouch
 USGS, Denver, Colorado
- Larry P. Gough
 USGS, Denver, Colorado
- Dennis Jenke, MERDI; Dick Hannifan, Don Beuerman, Montana Tech
- B. Patrick Heald
- James R. Herring
- Todd K. Hinkley
- Robert G. Hobbs
 USGS, Denver, Colorado
- Margaret Ikeda, Frank Diebold
- Edwin R. Landis
 USGS, Denver, Colorado
- Steve McGrath, Frank Diebold
- William J. Mapel
 USGS, Denver, Colorado
- William J. Mapel
 USGS, Denver, Colorado
- Jane Mathews, Robert Webster, Montana Bureau of Mines and Geology
- Robert E. Matson, Montana Bureau of Mines and Geology
- Marguerite McClellan
 USGS, Denver, Colorado
- Steve McGrath, Frank Diebold, Montana Tech
- E. A. Merewether
- Carter H. Miller
 USGS, Denver, Colorado

Energy (*continued*)

- 14 [See Areal Geology.] Fred K. Miller
- 143 Reservoir studies of the Madison Group, Disturbed Belt, Montana. [1981.] K. M. Nichols
USGS, Denver, Colorado
- 144 Study of the oil and gas resources of the Montana Disturbed Belt. [1983.] William J. Perry, Jr.
USGS, Denver, Colorado
- Geologic appraisal of petroleum provinces. Includes work on the Williston and Powder River basins. [Continuing.] James A. Peterson
USGS, Missoula, Montana
- Geology and oil and gas resource potential of the U.S. Overthrust Belt. [1983.] Richard B. Powers
USGS, Denver, Colorado
- Characterization of natural-gas resources in low-permeability reservoirs of the northern Great Plains. (Includes work on the Eagle Sandstone in central Montana.) [1984.] Dudley D. Rice
USGS, Denver, Colorado
- [See Isotope Geology and Geochronology.] Dudley D. Rice
- 145 Applied research on origin and distribution of natural gases. (Includes work on the natural gases from the Bearpaw Mountains area.) [1982.] Dudley D. Rice
USGS, Denver, Colorado
- 146 Coal resources of the northeast part of the Crow Indian Reservation. [1983.] Laura N. Robinson
USGS, Denver, Colorado
- Regional correlation of coal-bearing rocks in the Rocky Mountains. [Continuing.] Henry W. Roehler
USGS, Denver, Colorado
- 147 Geologic aspects of geophysical exploration for stratigraphic traps. Includes work in the Bell Creek field. Robert T. Ryder
USGS, Denver, Colorado
- [See Stratigraphy.] Robert T. Ryder
- A stratigraphic, tectonic and petroleum source-rock analysis of the Devonian and Mississippian of two related petroleum provinces—the developing Overthrust Belt and the related eastern Great Basin frontier province. [1984.] Charles A. Sandberg
USGS, Denver, Colorado
- Resource assessment in EMRIA program. Provides geologic guidance and analysis of coal resource and coal quality assessments from samples provided by the drilling program of the Bureau of Land Management. [Continuing.] Gary B. Schneider
USGS, Denver, Colorado
- 148 Petroleum reservoir rocks of the western United States. Will include field work in the Madison Group exposed in the Disturbed Belt. [1983.] Peter A. Scholle
USGS, Denver, Colorado
- [See Energy.] Ronald C. Severson
- 149 Geologic mapping and coal resource evaluation of Wibaux and Baker 30x60-minute quadrangles. [1982.] Mark A. Sholes, Robert N. Bergantino, Montana Bureau of Mines and Geology

Energy (*continued*)

- Forecast of future coal production from Montana coal deposits. [January 1982.]
Arnold J. Silverman
University of Montana
- Chemical analysis and evaluation of coal in the western United States. (Includes work on the Anderson, Canyon, Roland and Smith coal beds in Montana.) [Continuing.]
Frederick O. Simon
USGS
- Study of the relationship between volcanism and geothermal resources. (Includes work in Montana.) [Continuing.]
Robert L. Smith
USGS, Reston, Virginia
- Geochemistry of trace metals in the Rosebud coal seam, eastern Montana.
Tim Snelling, Doug Drew and Frank Diebold,
Montana Tech
- Evaluation of oil and gas resources on public land. [1981.]
Charles W. Spencer
USGS, Denver, Colorado
- [See Stratigraphy.]
Gray Thompson
- [See Geophysics.]
Charles J. Wideman,
Douglas W. Dresser and
James W. Halvorson
- Investigations of coal deposits in parts of McCone, Dawson, Prairie, Garfield and Custer counties.
Herbert C. Wincentsen
USGS, Billings, Montana
- *150 [See Hydrogeology.]
Glen M. Wyatt, John L. Sonderegger and Steve Custer

Hydrogeology

- [See Geophysics.]
Robert C. Anderson
- 151 Ground-water resources of the Ekalaka 1° x 2° quadrangle.
Robert N. Bergantino
Montana Bureau of Mines and Geology
- 152 Compilation of data for hydrogeologic maps for Montana Atlas. Work in progress on Miles City, Forsyth and Roundup 2° quadrangles. [Continuing.]
R. N. Bergantino, Roger Noble, T. W. Patton, Montana Bureau of Mines and Geology
- Hydrogeologic investigations in Montana—delineation of aquifers, characterization of water in them by use, quantity and quality, isopach and structure contour maps of aquifers. [Continuing.]
R. N. Bergantino, T. W. Patton, Roger Noble, Fred A. Schmidt, M. R. Miller, Judeykay Schofield, Art Middeldstadt, Montana Bureau of Mines and Geology
- 133 Stratigraphy, structure and sedimentation history of the East Decker coal mine site, with emphasis on coal hydrology. [1981.]
Robert A. Chadwick and Donald L. Smith
Montana State University

Hydrogeology (*continued*)

- 153 Prediction of the movement of mine-spoils water from spoils in the Colstrip and Decker areas. A solute transport model will be developed to simulate off-site movement of water into undisturbed aquifers. [September 1983.]
 Research on saline-seep drainage systems—north-central Montana. [October 1981.]
 [See Geochemistry.]
- 154 Interaction between ground- and surface-water regimes and associated acid-mine drainage in the Stockett-Sand Coulee coal field.
- 155 Measurement of total sediment yield using new induction coil techniques to determine cobble-size bedload-transport rates in Squaw Creek, Gallatin County.
 [See Structural Geology.]
- 72 [See Geochemistry.]
 A four-state regional appraisal of ground water in the Mesozoic and Cenozoic rocks of the northern Great Plains. [September 1981.]
- 156 Stillwater Complex base line surface water quality study in Stillwater and Sweet Grass counties.
- 157 Five-year base line water-quality study of Lake Creek, Lincoln County, downstream from the Troy project silver-copper mill site. [1984.]
- 158 Assessment of the ground-water resources of the Lake Creek valley south of Troy prior to the development of a copper mining operation and tailings pond in the area. [September 1981.]
- 159 Studies at seven specific sites in eastern Montana including a description of hydrologic characteristics and quality of water from coal, sandstone and alluvial aquifers, to determine base-line conditions in potential coal mine areas. [Four areas to be completed in 1981; three in 1982; new areas will be selected for future study.]
- Robert E. Davis, USGS Water Resources Division, Helena, Montana
- J. J. Donovan, M. R. Miller, Montana Bureau of Mines and Geology
- J. J. Donovan, John L. Sonderegger, M. R. Miller
- J. J. Donovan, John L. Sonderegger, M. R. Miller, W. A. Van Voast, Art Middelstadt, Montana Bureau of Mines and Geology
- Peter Ergenzinger, Steve Custer, Montana State University
- Richard Feltis
- B. Patrick Heald
- W. R. Hotchkiss, G. L. Levings, J. F. Levings, R. D. Feltis, Rita Frasure, K. A. Dodge, USGS, Water Resources Division, Helena, Montana
- D. C. Lawson, John L. Sonderegger, Montana Bureau of Mines and Geology
- D. C. Lawson, John L. Sonderegger, Montana Bureau of Mines and Geology
- Gary W. Levings, USGS Water Resources Division Helena, Montana
- Neal E. McClymonds, USGS Water Resources Division Helena, Montana

Hydrogeology (*continued*)

- Statewide hydrogeological data system—collection, analysis, compilation, storage and retrieval. [Continuing.]
- M. R. Miller, W. A. Van Voast, T. W. Patton, R. N. Bergantino, Judeykay Schofield, Roger Noble, F. A. Schmidt, Art Middelstadt, Montana Bureau of Mines and Geology
- 160 Hydrogeological conditions in the vicinity of Florence, Ravalli County.
- T. W. Patton, M. R. Miller, Montana Bureau of Mines and Geology
- 161 Availability of ground water for irrigation use in the Turner-Hogeland area.
- T. W. Patton, F. A. Schmidt, Art Middelstadt, Montana Bureau of Mines and Geology
- Statewide basic-data collection program.
- F. A. Schmidt, Art Middelstadt, Montana Bureau of Mines and Geology
- 162 Ground-water monitoring (both water level and quality) in the Poplar River area.
- F. A. Schmidt, Art Middelstadt, Montana Bureau of Mines and Geology
- 163 Study includes approximately 7,350 square miles bounded by the Missouri and Yellowstone rivers, the Big Dry Arm of Fort Peck Reservoir, and the Montana-North Dakota state line. The objectives of the study are to define base-line ground-water conditions, establish a data base of existing hydraulic and water-quality conditions, develop a network to monitor future changes of water level and water quality, and evaluate possible impacts of mining and related activities. [September 1981.]
- Steven E. Slagle, USGS Water Resources Division
Helena, Montana
- 164 Shallow ground water related to potential coal mining in the Bull Mountain area, central Montana. [1982.]
- K. S. Thompson, W. A. Van Voast, Montana Bureau of Mines and Geology, Billings
- 165 Mining-related hydrologic evaluations near the Big Sky mine, southeastern Montana. [Continuing.]
- W. A. Van Voast, J. J. McDermott, Montana Bureau of Mines and Geology, Billings
- Investigation of soluble salts in coal overburden and the qualities of ground waters in spoils. [1982.]
- W. A. Van Voast, J. J. McDermott, K. S. Thompson, Montana Bureau of Mines and Geology, Billings
- Shallow aquifer evaluation, southeastern Montana. [Continuing.]
- W. A. Van Voast, J. J. McDermott, K. S. Thompson, Montana Bureau of Mines and Geology, Billings
- 166 Hydrologic evaluations of the CX area, southeastern Montana. [1981.]
- W. A. Van Voast, K. S. Thompson, J. J. McDermott, Montana Bureau of Mines and Geology, Billings

Hydrogeology (*continued*)

- *150 Ground-water resources and geothermal potential of the Toston-Radersburg basin, Broadwater County. [June 1981.]
Glen M. Wyatt, Steve Custer, Montana State University; John L. Sonderegger, Montana Bureau of Mines and Geology

Geomorphology and Glacial Geology

- 167 The weathering of quartz monzonite and granodiorite and its relation to the geomorphology of the uplands of the Boulder batholith, near Boulder. [December 1981.]
Janette Young Black
Montana State University
- An attempt to put limiting dates on glaciation and glacial relocation of the Missouri River in north-eastern Montana, by dating clinker formed after those events. [1981.]
Donald A. Coates
USGS, Denver, Colorado
- 168 Late Cenozoic terraces in the Dearborn River basin, Lewis and Clark County. [Summer 1981.]
Michael G. Foley, University of Missouri, Columbia
- 169 Late Pleistocene diversion, incision and paleo-hydraulics of the Dearborn River, Lewis and Clark County. [Summer 1981.]
Michael G. Foley, University of Missouri, Columbia
- *170 Glacial geology of the Bear Gulch valley, Tobacco Root Mountains. [May 1982.]
Robert D. Hall, Indiana University/Purdue University
- Quaternary geologic map of the United States. [1983.]
Robert D. Hall, Indiana University/Purdue University
- *171 Glacial geology of the South Willow Creek valley, Tobacco Root Mountains. [May 1982.]
Robert D. Hall, Robert Martin, Bonnie Moore, Guy Swinford, Indiana University/Purdue University
- *99 Gravity survey in the Lima valley and a study of the Red Rock fault, including the geomorphic analysis of Recent fault scarps. [June 1981.]
Peter P. Johnson
University of Montana
- 38 [See Structural Geology.]
John Montagne
- *172 Alpine to sub-alpine drainage-head geomorphic features in the Taylor-Hilgard Mountains; water purification and retardation as affected by moraines, avalanche tongues, rock glaciers, landslides and talus. [1984.]
John Montagne
Montana State University

Environmental and Engineering Geology and Environmental Geochemistry

- 173 Geological engineering studies in the Helena area (proposed).
Edward C. Bingler, Montana Bureau of Mines and Geology

**Environmental and engineering geology and
environmental geochemistry (*continued*)**

- 174 Earthquake-hazard evaluation of the Townsend valley area, central western Montana (proposed). Edward C. Bingler, Montana Bureau of Mines and Geology
- 2 Mapping of the Quaternary geology and faulting in the Helena valley to assess earthquake hazard. [1981.] Edward C. Bingler, Michael Stickney, Montana Bureau of Mines and Geology
- [See Geophysics.] Edward C. Bingler and Michael Stickney
- Weathering effects on the geotechnical properties of coal-bearing rocks. [1984.] Alan F. Chleborad USGS, Golden, Colorado
- 175 Evaluation of the impact of ski compaction on runoff timing and amount in the Bridger Bowl ski area near Bozeman. [June 1981.] Steve Custer, John Montagne and Tom Grady Montana State University
- [See Geochemistry.] J. J. Donovan, John L. Sonderegger
- 138 [See Energy.] Larry P. Gough
- 176 Analysis of the geologic stability of Mystic Lake dam near Bozeman, and computer simulation of potential flooding from the failure of the dam. [June 1981.] Graham Hayes Montana State University
- [See Structural Geology.] Willis M. Johns and others
- 177 Regional engineering geologic studies of the Lodge Grass and Crow Agency areas. [1982.] Stephen P. Kanizay USGS, Denver, Colorado
- 13 [See Areal Geology.] Robert M. Lindvall
- [See Energy.] Carter H. Miller
- 57 [See Stratigraphy.] J. Moore
- Study of morphology of degraded normal fault scarps in cohesionless material to assess the potential for using morphology as a means of dating fault movement. David Nash University of Cincinnati
- Geotechnical research in western energy lands. Includes study of the seismicity of the Powder River basin. [1982.] Frank W. Osterwald USGS, Denver, Colorado
- *178 Quaternary dating and neotectonics. Includes obsidian hydration dating of pre-1959 faulting and ages of scarps in the Hebgen, Montana, earthquake area. [Continuing.] Kenneth L. Pierce USGS, Denver, Colorado
- 101 [See Geophysics.] A. M. Pitt
- [See Geophysics.] James C. Savage
- Element availability of soils in coal areas. [Continuing.] Ronald C. Severson USGS, Denver, Colorado

Back Pocket

Sheet 1—Index map of Montana.

Sheet 2—Index map of southwestern Montana.

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