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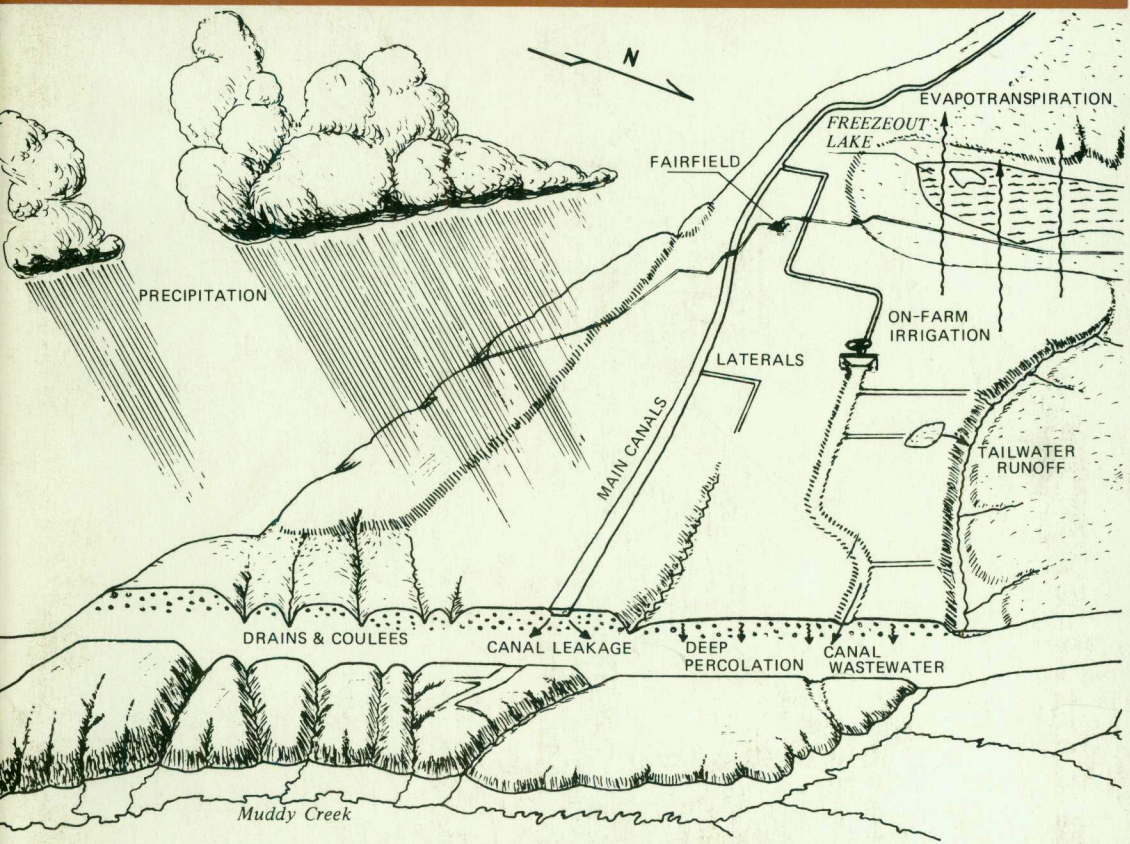
CURRENT GEOLOGICAL AND GEOPHYSICAL STUDIES IN MONTANA

compiled by

Richard B. Berg



Diagrammatic view of runoff from the Greenfield Bench.

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

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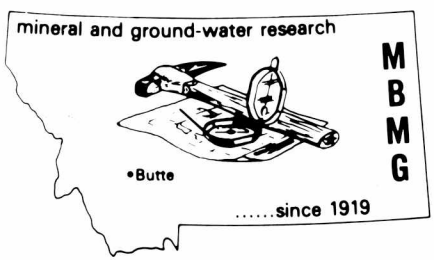

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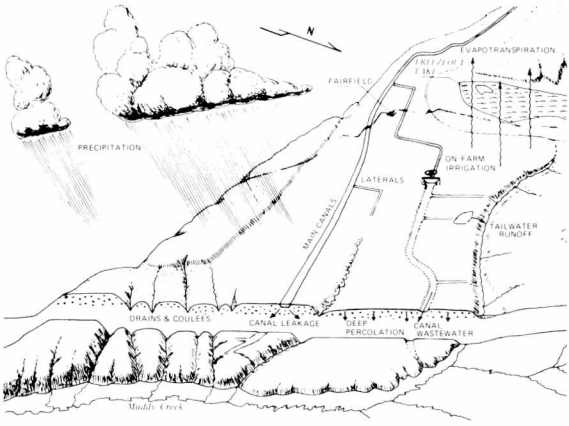
About the cover . . .



The Greenfield Bench

by

Thomas J. Osborne

A dynamic hydrologic system is maintained by irrigation of the Greenfield Bench, located 30 miles northwest of Great Falls, Montana. Several Quaternary gravel terraces comprise the Greenfield Bench and overlie marine shale and sandstone of the Colorado Group (Cretaceous).

The runoff of surplus irrigation water, ground water and precipitation has led to a severe erosion problem in Muddy Creek. The mean annual discharge of Muddy Creek has been increased by 10 times, resulting in dramatic channel downcutting and the introduction of large sediment loads to the lower Sun River and Missouri River. The channel has incised 40 feet since the 1920s into mostly fine-grained alluvial and glacio-lacustrine valley deposits. An average of over 200,000 tons of suspended sediment is discharged annually.

A detailed hydrologic investigation of the runoff sources from the Greenfield Bench was conducted by the Montana Bureau of Mines and Geology from 1981-83. Due to seepage losses and over irrigation, the delivery rate of water often exceeds three times the agricultural crop water demand. A hydrologic budget during 1982 showed that the crops of the Bench used about 33% of the total input water, while about 50% of input ended up as surface water and ground-water runoff.

Measures proposed to alleviate the erosion problem include irrigation scheduling by farmers, conversion to sprinklers and automated flood irrigation systems, lining of canals, a dam on Muddy Creek and reuse of ground water.

(Diagramatic sketch by Robert N. Bergantino.)

Contents

Sheets

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 catgegory, 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. Special Publication 88, Compilation and Index of Theses on Montana Geology 1899-1982, may be ordered from the Montana Bureau of Mines and Geology, Butte, Montana 59701, for $10 postpaid.

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.

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

Butte
March 15, 1985

Areal Geology

*1	Geology of the Dixon Mountain and Dell 7½-minute quadrangles, Beaverhead County. [1985]	M. J. Bartholomew, Montana Bureau of Mines and Geology, Robert Scholten, Pennsylvania State University
	Compilation of landslides in Montana (1:500,000-scale map). Maps at scales of 1:250,000 and 1:100,000 are anticipated. [1985]	M. J. Bartholomew, Montana Bureau of Mines and Geology; Roger B. Colton, USGS, Denver, Colorado; Earl E. Brabb, USGS, Menlo Park, California; Faith Daniel, South Dakota School of Mines and Technology
2	Geology of the Stockett and Great Falls SE 7½-minute quadrangles. [1986]	M. J. Bartholomew and others, Montana Bureau of Mines and Geology
3	Geology and mineral resources of the Belt 1:100,000-scale quadrangle, central Montana. [1987]	Richard B. Berg and Susan Vuke, Montana Bureau of Mines and Geology
4	Compilation of geology for the Sidney 1:100,000-scale quadrangle. [1985]	Robert N. Bergantino, Montana Bureau of Mines and Geology
5	Geologic map of the Wolf Point 1°x2° quadrangle. [1986]	Robert N. Bergantino, Montana Bureau of Mines and Geology
6	Geologic map of the Jordan 1°x2° quadrangle. [1987]	Robert N. Bergantino, Montana Bureau of Mines and Geology
*7	Geology and mineral resources of the Butte North 15-minute quadrangle (excluding the SE ¼). [1988]	Pamela Dunlap Derkey, Montana Bureau of Mines and Geology
8	Geology and mineral deposits of Silver Bow and Deer Lodge counties. [1987]	Robert E. Derkey, Montana Bureau of Mines and Geology
9	Geology and mineral deposits of the Deer Lodge quadrangle and the south half of the Avon quadrangle. [1986]	Robert E. Derkey, Montana Bureau of Mines and Geology
10	Geology of the Glendive 1:100,000-scale quadrangle, Montana and North Dakota.	Richard E. Eggleton, Roger Roger B. Colton, USGS, Denver, Colorado; Susan Vuke, Edith M. Wilde, Montana Bureau of Mines and Geology

Areal Geology (*continued*)

*11	Tertiary history of the area around Black Butte, Gravelly Range, Madison County. (Manuscript *in preparation*)	James T. Gutmann, Wesleyan University; Paul Pushkar, Wright State University; Malcolm C. McKenna, American Museum of Natural History
12	Geology of the Kalispell 1°x2° quadrangle in conjunction with continuing study of the Precambrian Belt basin. [1987]	Jack E. Harrison, USGS, Denver, Colorado
13	Geologic map of the Miles City 1:100,000-scale quadrangle. [Late 1985]	Stanley J. Luft, USGS, Denver, Colorado
14	Mapping principal coal beds in the Broadus 1:100,000-scale quadrangle. [1986]	Marguerite McClellan, USGS, Denver, Colorado
15	Geology of the NW ¼ of the White Sulphur Springs 1°x2° quadrangle. Geology to be mapped at 1:24,000 and 1:62,500 scales. [1987]	Henry G. McClernan, Montana Bureau of Mines and Geology
16	Evaluation of coal resources in the Cow and Antelope Creek Wilderness study areas. [1985]	Edward E. McGregor, USGS, Denver, Colorado
*17	Mapping and stratigraphic study of the coal-bearing Tertiary sediments in the Medicine Lodge and Horse Prairie basins, southwestern Montana and Idaho. Will be published as a compilation of four 7½-minute quadrangles. [Spring 1985]	John M'Gonigle, USGS, Denver, Colorado
18	Cenozoic history of the Yellowstone Valley between Livingston and Gardiner. [1987]	John Montagne, Montana State University
19	Geology of the SW ¼ of the Avon quadrangle. [1985]	Mark P. Peterson, Montana Tech
20	Geology and mineral resources of the White Sulphur Springs 1°x2° quadrangle.	Mitchell W. Reynolds, USGS, Denver, Colorado
	A bibliographic compilation of index maps delineating areas covered by geologic mapping in Montana—*continuing*.	Brenda Sholes, Montana Bureau of Mines and Geology
21	Detailed structural analysis of a portion of the Blackfoot thrust fault along the northwest flank of the Garnet Range near Potomac.	Michael B. Thomas, University of Montana
22	Geology of the Butte 1°x2° quadrangle.	Chester A. Wallace, USGS, Denver, Colorado
23	Geology of Glacier National Park. [1986]	James W. Whipple, USGS Spokane, Washington
24	Geologic and ground geomagnetic survey of the Coloma-Garnet area, Garnet Range. Emphasis is on the 2-dimensional computer modeling of the configuration of the Garnet stock contact in the subsurface.	Kurtis Wilkie, Iowa State University

Structural Geology/Tectonics

	[See Areal Geology.]	M. J. Bartholomew, Robert Scholten
25	Structural modeling of the Beartooth front—*Continuing*.	William E. Bonini, Princeton University
*26	Structural geology between Indian Creek and Alp Creek, west-central Madison Range. [Winter 1986]	Jeffrey Brown, Western Michigan University
*27	Mechanism of basement deformation in the cores of three foreland anticlines in Montana with comparisons to one anticline in Colorado and one in Wyoming. The Montana portion of this study will concentrate on the London Hills and Carmichael anticlines in the northern Tobacco Root Mountains and the Hinch Creek anticline in the northern Ruby Range. [Summer 1986]	Andrew Calder, Western Michigan University
*28	Structural geology and sedimentology of the Sphinx Mountain area, Madison Range and the Red Hill area, Gravelly Range. [Winter 1986]	Mark Caldwell, Western Michigan University
29	Structural analysis of the southern end of the Sawtooth Range approximately 16 km southeast of Augusta. [June 1986]	David M. Dolberg University of Montana
	Paleomagnetic study of thrust sheet kinematics in the Montana overthrust belt. [1985]	Sarah Eldredge, University of Michigan
	Structure, metamorphism and lithostratigraphy of Archean rocks in the southern Madison-Gravelly terrane and their relationship to regional Archean regimes—*continuing*.	Eric Erslev, Colorado State University
30	Structure, ^{40}Ar-^{39}Ar age and strain history of the Madison mylonite zone in the southern Madison range and the south Snowy block of the Beartooth Mountains. [1986]	Eric Erslev, Colorado State University
31	Structural configuration of bedrock aquifers and quality of water in bedrock in the Billings 1°x2° quadrangle. [September 1985]	Richard Feltis, USGS, Billings, Montana
*32	Structure and petrology of the Archean basement complex, Ruby Range, southwestern Montana—*continuing*.	John M. Garihan, Furman University
*33	Laramide foreland tectonics in the Ruby, Tobacco Root, Highland, Madison and Gallatin ranges in southwestern Montana. [1986]	John M. Garihan, Furman University; Christopher J. Schmidt, Western Michigan University
*34	Development of cleavage in the frontal fold and thrust belt near Melrose. [December 1985]	Beth Geiger, University of Montana
35	Paleomagnetism of Mesozoic/Cenozoic granites, Bitterroot lobe, Idaho batholith. [September 1986]	John W. Geissman, Colorado School of Mines

Structural Geology/Tectonics (*continued*)

36	Paleomagnetism, cooling history and structural development of the Stillwater Complex and associated units, Beartooth Mountains. [1985]	John W. Geissman, Colorado School of Mines
	Monitoring seismicity in northeastern Montana and southern Saskatchewan and studies of related structural geology.	Don Gendzwill, University of Saskatchewan
37	Structural style of deformation in Mesozoic rocks beneath the Bearmouth thrust from Bearmouth to Drummond. [June 1985]	Joseph Griffin, University of Montana
38	Study of the Libby thrust in the NE ¼ of the Fishtrap quadrangle, Sanders County. [May 1986]	Robert M. Hague, University of Idaho
*39	Structural geology and interpretation of the Lima Peaks area, Beaverhead County. [May 1985]	Phillip M. Hammons, Texas A & M University
*40	Structural significance of highly metamorphosed mafic dikes of the Tobacco Root Mountains. [1986]	Thomas B. Hanley, Columbus College
41	Textural and chemical trends of progressively mylonitized granite, Bitterroot Range.	Vicki L. Hansen, University of Montana
42	Structural elements of the Dry Fork anticline termination, Big Horn County. [December 1985]	Peter Henning, Texas A & M University
43	Structural mapping and strain analysis of a portion of the Taft Hill Member, Blackleaf Formation in the footwall of the Diversion thrust, Teton County. [1985]	Diane Johnson, Washington State University
	Structural geology and tectonic evolution of the Bridger Range and adjacent areas, southwestern Montana. This study involves the analysis of fault reactivation and tectonism from the Proterozoic to Recent—*continuing*.	David R. Lageson, Montana State University
*44	Geology, structure and geometrical analysis of structural relations along the south part of the Georgetown thrust, southwestern Montana.	David Lidke, USGS, Denver, Colorado
*45	Fault scarp analysis and paleoseismicity along the Madison front fault, southern Madison Range. [1985]	Scott Lundstrom, Humboldt State University; Nick Schneider, Miami University, Oxford, Ohio
*46	Deformation associated with a possible ductile thrust emplacement of the Butte Quartz Monzonite in the northern Highland Range. [1985]	Gerard Martin, Western Michigan University
*47	Investigation of the history of activity of the Madison Range fault along its 1959 rupture.	Elizabeth L. Mathieson, Stanford University
48	Petrology and structure of Precambrian rocks in part of the northern Gallatin Range. [June 1985]	Karen May, Montana State University
	Basement response to Laramide deformation in southwestern Montana. [June 1986]	Erick W. Miller, Montana State University

Structural Geology/Tectonics (*continued*)

*49	Structural evolution of the southern margin of the Belt basin in and adjacent to the Highland Mountains, southwestern Montana. [1988]	J. Michael O'Neill, USGS, Denver, Colorado
50	Analysis of variation in strain and deformational style across the brittle-ductile transition zone in the northern Jocko Mountains and Reservation Divide north of Missoula. The Wallace, Shepard and Mount Shields formations of the Belt Supergroup will be studied. [Fall 1985]	Kathleen Ort, University of Montana
51	Leopard rock protolith for polyphase deformed amphibolite, Beartooth Mountains—*continuing*.	John C. Palmquist, Lawrence University
52	Structural modeling of the Phanerozoic sedimentary rocks in the northwestern corner of the Beartooth block. [December 1985]	Elizabeth A. Robbins, Eric A. Erslev, Colorado State University
*53	Helium surveys will be conducted in the overthrust belt of Wyoming and Montana to determine whether the complex geology of the overthrust belt has a significant effect on the migration pathways for gases. These surveys will also try to determine whether soil-gas helium can be used to find the location and extent of thrust sheets. The Snowcrest foreland thrust northeast of Lima was surveyed. [1985]	Alan R. Roberts, USGS, Denver, Colorado
*54	Archean structural and petrologic evolution of the Spanish Peaks area, southwestern Montana. [September 1985]	Kenneth J. Salt, Montana State University
*55	Calcite twin strain and cleavage development in the Kootenai Formation in the Sandy Hollow duplex zone between Melrose and Dillon. [Fall 1986-Winter 1987]	Christopher Schmidt, Western Michigan University
*56	Development of minor structures and solution cleavage in the frontal thrust belt adjacent to foreland anticlines in Pole Canyon (near Cardwell) and the Camp Creek-McCartney Creek area (near Melrose). [Fall 1985]	Christopher Schmidt, Western Michigan University
	Nature of control of earlier structures on basin and range faulting, southwestern Montana—*continuing*.	Christopher Schmidt, Western Michigan University; John M. Garihan, Furman University; Hugh Dresser, Montana Tech
57	A breccia and retrograde metamorphic zone is exposed intermittently within the blastomylonites of the Bitterroot dome on the eastern edge of the Bitterroot Range. This study will define the geometric, mineralogical and strain relationships between the regional mylonitization and the local brecciation. [December 1985]	Eileen L. Shannon, Western Michigan University

Structural Geology/Tectonics (*continued*)

	Crustal study of southwestern Montana using seismic refraction—*continuing*.	Steven D. Sheriff, University of Montana
	Tectonic evolution of southwestern Montana, especially as reflected in the sedimentary record—*continuing*.	W. Thomas Straw, Western Michigan University
	Fission-track dating of selected plutonic rocks of the western Helena structural salient to determine timing of thrusting. [1985]	Jean Talanda, Western Michigan University
	[See Areal Geology.]	Michael B. Thomas
58	Strain analysis of the Lombard-Eldorado thrust sheet, Helena salient. [July 1985]	Michael L. Wells, Montana State University
59	Economic and structural geology of Seven Blackfoot and Burntlodge Wilderness study areas, Phillips, Valley and Garfield counties. [December 1985]	Courtaney Williamson, USGS, Denver, Colorado
60	Tectonic map of the Boulder batholith region at a scale of 1:250,000. [Late 1985]	Lee A. Woodward, University of New Mexico
*61	Determination of finite strain in Precambrian (pre-Belt) rocks of the Ruby Range, Madison County, Montana from analysis of deformed conglomerates. [1985 or 1986]	Jay Zimmerman, Southern Illinois University

Stratigraphy, Sedimentary Petrology and Paleontology

	Foraminiferal biostratigraphy and depositional environment of the Upper Cretaceous (Cenomanian-Santonian) Marias River Formation, north-central and northwestern Montana. [June 1985]	Adekoya A. Adedotun, Washington State University
62	Petrographic and field study of clastic sediments in the Libby trough, Sanders County. [May 1985]	Julie L. Apgar, University of Idaho
63	Stratigraphy, sedimentology and depositional environment of the Horsethief Formation and the Horsethief-Bearpaw transition from the area west of Augusta north to the area west of Choteau. [May 1985]	Carol Bilber, Montana State University
64	Mineralogy of the Cretaceous-Tertiary boundary claystone will be studied to confirm its origin as fallout from an asteroid impact. Sites studied are the Hell Creek area in Garfield County and the Glendive area in Dawson County. [October 1985]	Bruce F. Bohor, USGS, Denver, Colorado
*65	Study of the Mississippian rocks in the Snowcrest Range in southwestern Montana emphasizing lateral variations in thickness, biostratigraphy, lithology and depositional environments. Subdivision of the Madison Group and Big Snowy Group rocks into their respective subunits will be attempted. [Summer 1985]	David J. Byrne, Oregon State University

Stratigraphy, Sedimentary Petrology and Paleontology (*continued*)

	[See Structural Geology.]	Mark Caldwell
	Chronostratigraphy of mid-Cretaceous hydrocarbon source rocks, western interior—*continuing*.	William A. Cobban, USGS, Denver, Colorado
	Petrographic and petrologic studies of the Spokane, Grinnel and St. Regis formations to understand the distribution of copper.	Jon J. Connor, USGS, Denver, Colorado
66	Coal geology and sedimentology of the Morrison Formation in the Stockett-Sand Coulee area. [1986]	John A. Daniel, South Dakota School of Mines and Technology; M. J. Bartholomew, Montana Bureau of Mines and Geology
	Sedimentology and diagenesis of the Lower Cretaceous Kootenai Formation of southwestern Montana. [August 1984]	Peter A. DeCelles, Indiana University
67	Coal stratigraphy of the Lame Deer, Forsyth, Glendive, Jordan, Culbertson, Scobey and Circle 1:100,000-scale quadrangles—*continuing*.	Pamela Dunlap Derkey, Montana Bureau of Mines and Geology
*68	Stratigraphic and petrographic analysis of the Lower Cretaceous Blackleaf Formation near Lima. [1985]	Thaddeus S. Dyman, Washington State University
	Magnetic stratigraphic correlations in the Belt basin of Montana and Idaho. [1986]	Donald P. Elston, USGS, Flagstaff, Arizona
	Tertiary basins of western Montana and eastern Idaho. Their stratigraphy, sedimentation, paleontology and history—*continuing*.	Robert W. Fields University of Montana
*69	Biostratigraphy, magnetic polarity stratigraphy and geochronology of Oligocene strata, Black Butte area, Madison County. [1986]	John J. Flynn, Rutgers University; Malcolm C. McKenna, Andre Wyss, American Museum of Natural History
	Studies of Paleocene silcrete, southeastern Montana.	Judith S. Gassaway, USGS, Denver, Colorado
	A sedimentologic-geochemical investigation of controls on reservoir quality in low-permeability gas reservoirs, including reservoirs in Cretaceous units in Montana. [1985]	Donald L. Gautier, USGS, Denver, Colorado
70	Taxonomy and biostratigraphy of bryozoans in the Otter Formation of the Little Belt and Little Snowy mountains. [Winter 1986]	Ernest H. Gilmour, Eastern Washington University
	Physical characteristics of carbonate reservoir rocks, including study of the Mission Canyon, Bakken and Red River formations of the Williston basin. [1985]	R. B. Halley, USGS, Denver, Colorado
	Studies of the taxonomy, taphonomy, paleoecology and biostratigraphy of nonmarine Mollusca from the upper Tongue River Member of the Fort Union Formation. [1987]	John H. Hanley, USGS, Denver, Colorado

Stratigraphy, Sedimentary Petrology and Paleontology (*continued*)

71	The relationship between diagenesis and regional porosity development and distribution in the Sun River Member of the Castle Reef Formation (Upper Mississippian), Sawtooth Range, northwestern Montana. [June 1986]	Mary K. Harris, University of Idaho
	[See Areal Geology.]	
	Petrology, lithofacies and diagenesis of the Upper Cambrian Pilgrim Formation in west-central Montana. [May 1985]	Michael P. Healy, University of Idaho
72	Sedimentation and mineralization of a sandstone-hosted Pb-Zn occurrence in the Helena Formation of the Belt Supergroup in northwestern Montana. [June 1985]	Don Herberger, University of Montana
73	Facies mapping of the Belfry Member of the Fort Union Formation. [June 1986]	Leo J. Hickey, Peabody Museum, Yale University
74	Flora and stratigraphy of the Fort Union Formation in the Big Horn basin, Montana and Wyoming. [1985]	Leo J. Hickey, Peabody Museum, Yale University
	Study of the rhythmites of the Paine Member, Lodgepole Limestone, southwestern Montana. [Spring 1985]	Jennifer Hill, Indiana University
75	Petrography, palynology and origin of coals in the Red Lodge and Bridger coal fields, Carbon County. [1987]	Roy Jensen, South Dakota School of Mines and Technology
76	Paleontology of a Cambrian outcrop near Noxon. This is part of a larger project dealing with Cambrian paleontology in Idaho.	Dave Kachek, University of Idaho
*77	Stratigraphy and depositional history of the Amsden Formation and lower Quadrant Sandstone, Snowcrest Range, Beaverhead and Madison counties. [December 1985]	Colin Key, Oregon State University
78	Investigation of a coastal eolian dune system in the Upper Cretaceous Two Medicine Formation in northwestern Montana. [June 1985]	Jeffery E. Larson, University of Montana
*79	Tertiary stratigraphy, structure and vertebrate paleontology of the North Boulder basin, Jefferson County. [1985]	Don Lofgren, University of Montana
80	Sedimentological analysis and paleo-reconstruction of the Prichard-Ravalli transition in the Salish Mountains approximately 20 miles east of Libby. Includes stable isotope and microprobe analysis of calcareous strata at this transition. [June 1985]	Kenneth D. Loos, University of Cincinnati
	[See Areal Geology.]	John M'Gonigle

Stratigraphy, Sedimentary Petrology and Paleontology (*continued*)

81	Tectonic controls on the structures, sedimentology and stratigraphy of the southern portion of the Upper Cretaceous Golden Spike Formation, central-western Montana.	Thomas L. Mackie, Washington State University
	Study of petroleum source rock characteristics and depositional setting of Upper Mississippian and Lower Pennsylvanian beds in Utah, Idaho, Wyoming and Montana. [September 1985]	Edwin K. Maughan, USGS, Denver, Colorado
	Stratigraphy and petrology of carbonate sediments in the Ellis Group of western Montana: The influence of tidal currents, storms and tectonic uplift facies patterns—*continuing*.	James H. Meyers, Winona State University
	Depositional and diagenetic environments of the Jurassic Rierdon Formation (Ellis Group) south and southeast of the Belt Island tectonic uplift. [January 1986]	Dennis Michaud, Indiana University, Bloomington
82	Metal and sediment geochemistry in the Missouri River and Lake Helena. [1986]	Johnnie N. Moore, University of Montana
	Sedimentation and sediment chemistry of the Clark Fork River. [1986]	Johnnie N. Moore, University of Montana
83	Palynology of the thrust belt, western United States. Includes microstratigraphic analysis of uninterupted sedimentary sequences crossing the Cretaceous-Tertiary boundary in the Hell Creek area, Garfield County. [1988]	Douglas J. Nichols, USGS, Denver, Colorado
	Modeling global ecologic catastrophes in geologic time. Includes work on the Hell Creek Formation in Montana. [1988]	Douglas J. Nichols, USGS, Denver, Colorado
84	Trilobite biostratigraphy of the Gordon Shale in the southern part of the Libby trough, Sanders County. [May 1985]	David P. O'Malley, Washington State University
	[See Structural Geology.]	J. Michael O'Neill
*85	Study of the Permian-Triassic unconformity and the conodont biostratigraphy of the Lower Triassic Dinwoody Formation in southwestern Montana. [1987?]	Rachel K. Paull, University of Wisconsin-Milwaukee
	Diagenetic and depositional history of the carbonate-sandstone cycles in the Amsden Formation and Quadrant Sandstone, Tobacco Root Mountains. [April 1985]	Ann M. Petricca, Indiana University, Bloomington
	Study of metals in Mississippian shales in western Montana. [September 1985]	Forrest G. Poole, USGS, Denver, Colorado
	Sedimentology and diagenetic history of the Mission Canyon Formation (Mississippian Madison Group), central Montana. [September 1986]	Dan C. Quigley, Washington State University

Stratigraphy, Sedimentary Petrology and Paleontology (*continued*)

	Study of cementation and dolomitization of the Cambrian Meagher Formation in southwestern Montana and the possible relationship to the limestone-dolomite "transition zone." [May 1986]	Steven K. Reid, University of Idaho
	Stratigraphy and vertebrate paleontology across the Cretaceous/Tertiary boundary (Hell Creek and Tullock formations) in McCone and Powder River counties. [December 1987]	J. Keith Rigby, Jr., University of Notre Dame
	Study of dilution effect on sediment derived from the Stillwater Complex.	Dale Ritter, Southern Illinois University; Susan Howes, Lamar University; Marvin Kauffman, American Geological Institute
	[See Structural Geology.]	Eric A. Erslev
86	Stratigraphic and petrographic study of the Ellis Group (Jurassic) exposed on the north flank of the Little Belt Mountains.	J. Elise Robocker, Montana Tech
	Identification and correlation of coal-forming depositional environments and time-stratigraphic units across the intermontane basins of the Rocky Mountains—*continuing*.	Henry W. Roehler, USGS, Denver, Colorado
87	Tertiary geology and vertebrate paleontology of the Smith River basin, Meagher County.	Anthony Runkel, University of Montana
	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. [September 1985]	Charles A. Sandberg, USGS, Denver, Colorado
*88	Stratigraphy and structure of Mississippian rocks in the Tendoy Range, Beaverhead County.	William J. Sando, U.S. National Museum, Washington, D.C.
	Sedimentology and paleotectonics of the Quadrant Sandstone, southwestern Montana. [June 1985]	Herb Saperstone, Colorado State University/USGS, Denver, Colorado
89	A sedimentologic and provenance investigation of the Late Cretaceous-Early Tertiary Livingston Group and Fort Union Formation in the Crazy Mountain basin. [1987]	James Schmitt, Montana State University
	Investigation of the Bakken Formation in the Williston basin, Montana and North Dakota with emphasis on physical parameters, organic matter content and source rock maturity. [1985]	James W. Schmoker, USGS, Denver, Colorado
	Stratigraphy and coal resources of the Tertiary intermontane basins of western Montana. [1987]	Gary B. Schneider, USGS, Denver, Colorado

Stratigraphy, Sedimentary Petrology and Paleontology (*continued*)

90	Tertiary sedimentary tectonics and stratigraphy, South Fork basin, Flathead River, Flathead County. [Fall 1985]	Scott Singdahlsen, Montana State University
	Sedimentology, stratigraphy and diagenetic history of the upper part of the Jefferson Formation and Logan Gulch Member of the Three Forks Formation, southwestern Montana. [September 1986]	Tad M. Smith, Washington State University
	Stratigraphy and depositional environment of the lower sandstone member of the Thermopolis Formation in the northern Gallatin Range, Bridger Range and Horseshoe Hills, southwestern Montana. [Spring 1985]	Allan Stine, Montana State University
	[See Structural Geology.]	W. Thomas Straw
	Tectonic controls on Mesozoic non-marine sedimentation in the foreland basin of western Montana—*continuing*.	Lee J. Suttner, Indiana University, Bloomington
91	Sedimentology and petrology of the Kootenai Formation in the disturbed belt (Sun River area). [Spring 1985]	Lee J. Suttner, Greg Berkhouse, Indiana University, Bloomington
	Depositional environment, diagenesis and petroleum potential of the Permian Shedhorn Sandstone in southwest Montana and northwest Yellowstone National Park. [September 1986]	Janet Bauder Thornburg, University of Colorado
92	Petrology and depositional environments of the Hulett Sandstone Member and associated facies of the Sundance Formation in the northern Bighorn basin. [1987]	John Utgaard, Southern Illinois University
	Study of the existence, magnitude and timing of major extinction episodes of fossil floras and faunas in Phanerozoic time. [1988]	Bruce R. Wardlaw, National Museum of Natural History, Washington, D.C.
	Taxonomic, paleoecologic, evolutionary and biostratigraphic study of Mississippian crinoids in central and western Montana. [January 1987]	G. D. Webster, Washington State University
93	Sedimentology of the Altyn Formation (Precambrian) of Glacier National Park: A study of microbiotas, stromatolites and evaporitic dolomites in shallowing-upward cycles—*continuing*.	Brain White, Smith College
94	Investigation of the occurrence of ash beds in a varve sequence at Marias Pass. [1985]	Ray E. Wilcox, USGS, Denver, Colorado
	Stratigraphy and sedimentology of the Ravalli Group, middle Belt carbonate and Missoula Group of the Belt Supergroup—*continuing*.	Don Winston, University of Montana
	Analyses of fossil plant collections from the Tongue River Member of the Fort Union Formation. [1986]	J. A. Wolfe, USGS, Denver, Colorado

Stratigraphy, Sedimentary Petrology and Paleontology *(continued)*

	Detailed sedimentologic and stratigraphic study of the Shepard Formation (Belt Supergroup) in the southern Mission, Swan, and Lewis and Clark ranges. [June 1985]	Marvin Woods, University of Montana
95	Facies relationships, depositional characteristics and paleochemistry of possible lacustrine environments in the Paleocene Fort Union Formation of the northern Bighorn basin. [December 1986]	Richard F. Yuretich, University of Massachusetts

Geochemistry, Mineralogy and Petrology

96	Petrologic and geochemical studies of the alkaline complexes at Rainy Creek, Haines Point, Bobtail Creek, Warland Creek and the Skalkaho area constitute part of a study of thorium resources. [1985]	Theodore J. Armbrustmacher, USGS, Denver, Colorado
	Determination of geochemical attributes of precious-metal deposits in southwestern Montana and the relation of these deposits to the genesis of batholithic rocks. [September 1986]	Byron R. Berger, USGS, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Petrology.]	Bruce F. Bohor
*97	Geochemical study of the mass transfer associated with the formation of talc deposits, Ruby Range—*continuing*.	John B. Brady, Smith College
	Geochemistry and economic geology of hydrothermal vein carbonate-fluorspar deposits, western Montana—*continuing*.	D. G. Brookins, University of New Mexico
98	Geochemical and analytical studies of the platinum-group elements including samples from the Stillwater Complex.	Robert R. Carlson, USGS, Denver, Colorado
99	Volcanic and related intrusive rocks of the Gallatin Range and adjacent region—*continuing*.	Robert A. Chadwick, Montana State University
100	Evolution of the volcanic field in the Yellowstone Plateau-Island Park area of Wyoming, Idaho and Montana. [1985]	Robert L. Christiansen, USGS, Menlo Park, California
	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*.	Jerry L. Clayton, USGS, Denver, Colorado
101	Study of the basal-zone sulfides in the Stillwater Complex. [1985]	G. K. Czamanske, USGS, Menlo Park, California

Geochemistry, Mineralogy and Petrology (*continued*)

*102	Trace-element partitioning in coexisting garnet-clinopyroxene and garnet-biotite in high-grade metamorphic rocks in the Ruby Range. [May 1986]	Peter S. Dahl, Robert C. Hendricks, Kent State University
103	Geology and mineral deposits of Cretaceous-Tertiary volcanic rocks in the vicinity of the Boulder batholith. [1988]	Robert E. Derkey, Montana Bureau of Mines and Geology
104	Examination of the Cu/Ni distribution in the disseminated and net-textured sulfides in the Stillwater Complex based on Cu/Ni assay patterns.	L. J. Drew, USGS, Reston, Virginia
	[See Structural Geology.]	Eric Erslev
*105	Study of metamorphic conditions as they relate to ore deposition in the Iron Rod and Silver Star mining districts, Madison County. [Spring 1985]	Martin Foote, University of Wyoming
106	Petrologic investigation of selected gravel terraces in the Bighorn basin, Carbon County. [March 1986]	Charles O. Frank, Southern Illinois University
*107	Petrographic and geochemical study of the Precambrian rocks in the Stone Creek area of the Ruby Mountains, Madison County. The study will concentrate on the mineralogy of high grade metamorphic rocks and the affects of late Precambrian low grade metamorphism on the high grade mineral assemblages. [December 1985]	Bruce Garbaccio, California State University, Los Angeles
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Donald L. Gautier
	[See Areal Geology.]	James T. Gutmann, Paul Pushkar, Malcolm C. McKenna
*108	Volcanic geology of the Lion Mountain area, Gravelly Range, Madison County. [1986]	James T. Gutmann, Wesleyan University; Paul Pushkar, Wright State University
109	Petrology and geochemistry of the mixed lavas at Gardiner, River, Yellowstone National Park. [June 1985]	Russell Guy, A. Krishna Sinha, Virginia Polytechnic Institute and State University
110	Geochemistry of the Archean basement in Yankee Jim Canyon and its relationship to the lavas in Yellowstone National Park. [June 1985]	Russell Guy, A. Krishna Sinha, Virginia Polytechnic Institute and State University
*111	Descriptive geochemistry of metamorphosed mafic dikes of the Tobacco Root Mountains. Major, minor and limited trace element analyses of medium- to fine-grained, generally discordant, garnetiferous tholeiites. [1986]	Thomas B. Hanley, Columbus College

Geochemistry, Mineralogy and Petrology (*continued*)

	[See Structural Geology.]	Vicki L. Hansen
	Study of kimberlitic diatremes in Montana including chemical and isotopic analysis of mineral separates—*continuing*.	B. Carter Hearn, USGS, Reston, Virginia
*112	Mineralogic and geochemical study of amphibolites in the Tobacco Root Mountains, Madison County. (Preliminary draft of manuscript completed 1985 or 1986.)	David F. Hess, Western Illinois University; Charles J. Vitaliano, Indiana University
	Geochemistry of selenium in upper Cretaceous volcanic rocks and derived sedimentary rocks in Gallatin, Lewis and Clark, Jefferson and Powell counties. [1985]	J. Hatten Howard III, University of Georgia
113	Study of the mafic dikes associated with the Idaho batholith, Montana and Idaho—*continuing*.	Donald W. Hyndman, University of Montana
	Study of alkaline igneous rocks of the Central Montana Province—*continuing*.	Donald Hyndman, University of Montana
114	Petrogenesis of anorthosites of the Stillwater Complex. [1986]	Patricia J. Loferski, USGS, Reston, Virginia
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Kenneth D. Loos
	Early and middle Cenozoic volcanic centers, western conterminous United States. [1988]	R. G. Luedke, USGS, Reston, Virginia
	[See Structural Geology.]	Karen May
115	Igneous history of the Highwood Mountains. [1986]	I. S. McCallum, A. J. Irvine, H. O'Brien, University of Washington
116	Petrology and geochemistry of the Stillwater Complex. [1984-1985]	I. S. McCallum, University of Washington; A. Boudreau, L. Criscenti, L. Raedeke, L. Haskin, P. Salpas, Washington University (St. Louis)
117	Archean geology of southwestern Montana, including the Beartooth Mountains and northern Madison Range—*continuing*.	Dave Mogk, Montana State University
118	Study of Sr and O isotopic systematics in Archean granitoid and associated rocks in the southern Beartooth Range. Also major, minor and trace-element geochemistry. [1986 or later]	Carla W. Montgomery, Northern Illinois University
119	Stable isotope geochemistry and phase equilibria study of the Boehls Butte and Bitterroot anorthosites and surrounding Beltian metasediments. [May 1986]	C. I. Mora, University of Wisconsin, Madison

Geochemistry, Mineralogy and Petrology (*continued*)

	Geochemistry and geochronology of the Archean basement of southwestern Montana. [1990]	Paul A. Mueller, University of Florida; Joe L. Wooden, USGS, Menlo Park, California; Dave Mogk, Montana State University; Eric Erslev, D. Henry, Colorado State University
	[See Structural Geology.]	John C. Palmquist
120	Investigation of the chemistry and mineralogy of the association of sulfide minerals, magnetite and graphite with platinoids in the Stillwater Complex.	Mike Paseczyk, Alex Volborth, Montana Tech
	Chemical and isotopic evidence of the origins of natural gases. [1985]	Dudley D. Rice, USGS, Denver, Colorado
121	Archean geology of the Lake Plateau, central Beartooth Mountains. [January 1986]	Doug Richmond, Montana State University
122	Outcrop-scale mapping of intrusive structures and magmatic textues in the Stillwater Complex as part of an investigation of the internal structure of magmatic systems. [1989]	Michael P. Ryan, USGS, Reston, Virginia
	[See Structural Geology.]	Kenneth J. Salt
123	Paleomagnetic determination of the age of serpentinization of mafic rocks of the Stillwater Complex and relationship to PGM mineralization and alteration. [August 1985]	John Saxton, Colorado School of Mines
	[See Structural Geology.]	Eileen L. Shannon
124	Description and petrographic study of the newly discovered remnants of a volcanic caldera along the Idaho-Montana border west of Missoula. This caldera is adjacent to the Lolo batholith and is apparently genetically related to it. [June 1985]	Stephen J. Simpson, University of Montana
125	Study of the stratigraphy, mineralogy and geochemistry of a Cu-Ag stratabound occurrence in Missoula Group rocks northeast of Thompson Falls. Also the statistical evaluation of exploration geochemical data. [January 1985]	Clifford R. Stanley, University of British Columbia
126	Alteration petrology at the Flathead mine and associated ash-flow tuffs. [1986]	Graham R. Thompson, University of Montana
	Determination of the thermodynamic properties of water adsorbed on the surface of coal of the Rosebud coal seam. [June 1986]	Judi Todd, Doug Coe, Frank Diebold, Montana Tech
*127	Petrologic studies of igneous rocks in the Pioneer Mountains.	Priestley Toulmin, USGS, Reston, Virginia

Geochemistry, Mineralogy and Petrology (*continued*)

*128	Detailed petrologic, petrochemical and structural study of the Tobacco Root batholith, Madison County—*continuing*.	Charles J. Vitaliano, Indiana University; John Smith, Standard Oil of California; David F. Hess, Western Illinois University
*129	Metabasites of the Tobacco Root Mountains.	Charles J. Vitaliano, Indiana University; Thomas B. Hanley, Columbus College
*130	Orthoamphibolites of the Tobacco Root Mountains.	Charles J. Vitaliano, Indiana University; David F. Hess, Western Illinois University
*131	The 10-N pluton.	Charles J. Vitaliano, John A. Rupp, Indiana University
132	Chemical evolution of the Elkhorn Mountains Volcanics.	Thomas A. Vogel, Carolyn Rutland, Michigan State University
133	Petrology of anorthosites of the Stillwater Complex—*continuing*.	Alexis Volborth, Montana Tech
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Ray E. Wilcox
134	Studies of the macroscopic and microscopic fluid dynamics of the Stillwater Complex. [1985]	Thomas L. Wright, USGS, Reston, Virginia
135	Mineralogy of the Black Pine mine, Granite County—*continuing*.	Lester Zeihen, Montana Tech

Isotope Geology and Geochronology

*136	Geochronologic studies including work on rocks from the Pioneer Mountains. [1985]	Joseph G. Arth, USGS, Reston, Virginia
137	Distribution of the Anderson and Knoblock clinker in the Ashland area. Fission-track ages of clinker will be used to shed light on downcutting history of the Tongue River. [1986]	Donald A. Coates, Edward L. Heffern, USGS, Denver, Colorado
	[See Structural Geology.]	Eric Erslev
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	John J. Flynn, Malcolm C. McKenna, Andre Wyss
138	A delta-D study of water in and adjacent to Yellowstone National Park to determine the connection, if any, between the Yellowstone geothermal system and adjacent hydrologic basins. A study of the chloride flux out of Yellowstone National Park will also be initiated. [October 1985]	Irving Friedman, USGS, Denver, Colorado

Isotope Geology and Geochronology (*continued*)

	Nd isotopic study of the Belt-Purcell Supergroup. Nd isotopic information from diverse geographic and stratigraphic locations within the Belt-Purcell Supergroup will be combined with sedimentological and tectonic information to determine sediment source directions and to detect any crustal additions within the Belt source areas during deposition [Summer 1985]	Carol D. Frost, University of Wyoming
	[See Areal Geology.]	James T. Gutmann, Paul Pushkar, Malcolm C. McKenna
	[See Geochemistry, Mineralogy and Petrology.]	Russel Guy A. Krishna Sinha
	[See Geochemistry, Mineralogy and Petrology.]	Russel Guy A. Krishna Sinha
	[See Geochemistry, Mineralogy and Petrology.]	B. Carter Hearn
139	Stable isotope ratios of runoff and geothermal water in and around Yellowstone National Park and the constraints on the hydrology of the geothermal features. [1986]	T. Kurtis Kyser, University of Saskatchewan
140	Geology and geochronology of the Silverbell stock and surrounding area.	Ian M. Lange, University of Montana; Charles Naeser, USGS, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Kenneth D. Loos
	[See Geochemistry, Mineralogy and Petrology.]	Carla W. Montgomery
	[See Geochemistry, Mineralogy and Petrology.]	C. I. Mora
	[See Geochemistry, Mineralogy and Petrology.]	Paul A. Mueller, Joe L. Wooden, Dave Mogk, Eric Erslev, D. Henry
141	Geochronology of the Cretaceous-Tertiary boundary as defined by the last appearance of dinosaurs, the major palynological break and the geochemical iridium anomaly in the Hell Creek area.	Charles W. Naeser, USGS, Denver, Colorado
142	K-Ca and ^{40}Ar-^{39}Ar dating of minerals from the Stillwater Complex to better understand isotopic systems. [1985]	Charles W. Naeser, USGS, Denver, Colorado
	Geochronology of basement rocks in the Williston basin. [1985]	Zell E. Peterman, USGS, Denver, Colorado
*143	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

Isotope Geology and Geochronology (*continued*)

	[See Geochemistry, Mineralogy and Petrology.]	Dudley D. Rice
	Rb/Sr dating of selected exposures of fault gouge and constraints on timing of thrust faulting, southwestern Montana. [1985]	Carolyn Rutland, Michigan State University; Leon Long, University of Texas
144	The Spar Lake copper-silver deposits in conjunction with stable isotope studies of ore deposits. Also sulfur isotope studies of the Yellowstone geothermal system. [1986]	Robert O. Rye, USGS, Denver, Colorado
	Geochronologic investigations include zircon age determinations of samples from Montana. [1985]	Thomas W. Stern, USGS, Reston, Virginia
	[See Structural Geology.]	
145	Sm-Nd analyses of mineral separates from the Stillwater Complex. [1985]	Mitsunobu Tatsumoto, USGS, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Ray E. Wilcox

Geophysics

	A series of vertical seismic profiles is planned in Montana and Wyoming to measure the acoustic properties of tight gas sands before and after hydrofracturing. [1985]	Alfred H. Balch, USGS, Denver, Colorado
	[See Structural Geology.]	William E. Bonini
146	Columbia University's Mark II airborne spectroradiometer system will be used to acquire airborne spectroradiometer data at mineralized sites including Cotter basin, Montana. [1986]	Frank C. Canney, USGS, Denver, Colorado
	Crustal study of northwestern Montana using seismic refraction techniques. [June 1986]	William P. Clement, University of Montana
	Computation of preliminary epicenters for regionally and teleseismically recorded earthquakes that occurred in Montana, northwestern Wyoming and Idaho in the period 1925 through 1980. [1985]	James W. Dewey, USGS, Denver, Colorado
	[See Structural Geology.]	Sarah Eldredge
*147	A study of the paleomagnetic of mineralized terranes will include the Pioneer batholith. [1986]	Donald P. Elston, USGS, Flagstaff, Arizona
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Donald P. Elston
	[See Structural Geology.]	John W. Geissman
	[See Structural Geology.]	John W. Geissman
	[See Structural Geology.]	Don Gendzwill
	Vertical seismic profiling of tight gas sands in Montana and Wyoming. [September 1985]	J. A. Grow, USGS, Denver, Colorado

Geophysics (*continued*)

148	Collection and intrepretation of remanent and induced magnetization data for rock samples from the Butte 1°x2° quadrangle. [1985]	William F. Hanna, USGS, Denver, Colorado
149	Aeromagnetic interpretation and modeling of the Boulder batholith and the Butte 1°x2° quadrangle. [May 1985]	Brian S. Hoare, University of Wyoming
150	Geoelectrical survey of the Ten Lakes and Mt. Henry Wilderness study areas. [1985]	Donald B. Hoover, USGS, Denver, Colorado
151	Gravity surveys in the Kalispell, Great Falls, White Sulphur Springs and Bozeman 1°x2° quadrangles. [1985]	M. Dean Kleinkopf, USGS, Denver, Colorado
	[See Structural Geology.]	David R. Lageson
	[See Structural Geology.]	Scott Lundstrom, Nick Schneider
	[See Structural Geology.]	Elizabeth L. Mathieson
*152	Regional Bouguer gravity profile and modeling from the Beaverhead Valley near Twin Bridges to the Madison Valley near Cameron. [Fall 1985]	William Moorse, Western Michigan University
	BLM wilderness geophysical studies. [October 1986]	Calvin K. Moss, USGS, Denver, Colorado
*153	Delineation of a feeder dike in Wolverine basin in the Gravelly Range using gravity and magnetic determinations. Also investigation of the occurrence of banded iron-formations in the Gravelly Range. [July 1985]	William A. Randall, Jr., Wright State University
154	Investigation of the spectral reflectance of mineralized areas includes an alteration map and lineament analysis of the Anaconda-Pintlar Wilderness area. [1985]	Lawrence C. Rowan, USGS, Reston, Virginia
	[See Geochemistry, Mineralogy and Petrology.]	John Saxton
	[See Structural Geology.]	Steven D. Sheriff
*155	Gravity study of the southern margin of the Belt basin, Highland Mountains and Tobacco Root Mountains. [1985]	Carl Smith, University of Texas at El Paso
	Seismic monitoring and analysis of earthquake data within the Intermountain seismic belt in western Montana—*continuing*.	Michael Stickney, Montana Bureau of Mines and Geology
*156	Bouger gravity profiles and modeling of foreland thrusts and adjacent extensional basins—northwestern Madison Range and western Tobacco Root Range. [Summer 1985]	Stephen Wigger, Western Michigan University
	[See Areal Geology.]	Kurtis Wilkie

Geophysics (*continued*)

157	Gravity survey of Glacier National Park and a regional gravity transect from the Glacier-Toole County line 50 miles east of the park, to Kila Mountains, 50 miles west of the park. [1985]	Dolores M. Wilson, USGS, Denver, Colorado
158	Evaluation of inductive conductivity and self potential reconnaissance methods to delineate mine workings and source regions of acid mine drainage in the Stockett-Sand Coulee area.	Marek Zaluski, Montana Bureau of Mines and Geology; William R. Sill, Montana Tech

Economic Geology

	Geochemical exploration in western Montana—*continuing*.	John C. Antweiler, USGS, Denver, Colorado
159	An estimation of the grade *(in situ)* and tonnage relationship for the Mouat orebody in the Stillwater Complex; also alternative exploration strategies for copper and nickel in the Stillwater Complex will be appraised. [1986]	E. D. Attanasi, USGS, Reston, Virginia
	[See Areal Geology.]	Richard B. Berg, Susan Vuke
	Geology of Montana barite deposits. (Preliminary information available in MBMG Open-File Report 95.) [1985]	Richard B. Berg Montana Bureau of Mines and Geology
	[See Geochemistry, Mineralogy and Petrology.]	Byron R. Berger
*160	Mineralogy and distribution of alteration zones in rocks and soils associated with talc deposits. This investigation is primarily confined to mines and prospects in the Ruby Range. [January 1986]	Alice M. Blount, The Newark Museum, Newark, N.J.
	[See Geochemistry, Mineralogy and Petrology.]	John B. Brady
	[See Geochemistry, Mineralogy and Petrology.]	D. G. Brookins
	[See Geophysics.]	Frank C. Canney
*161	Future production potential of critical commodities. (Includes investigation of the history of copper mining at Butte.) [September 1985]	Simon Cargill, USGS, Reston, Virginia
	[See Geochemistry, Mineralogy and Petrology.]	Robert R. Carlson
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Jon J. Connor
	[See Areal Geology.]	Pamela Dunlap Derkey
	Mines and prospects computerized data base for Montana. Information on metallic mines and prospects in Silver Bow, Deer Lodge and Lewis and Clark counties is being entered first—*continuing*.	Pamela Dunlap Derkey, Robert E. Derkey, Montana Bureau of Mines and Geology

Economic Geology (*continued*)

	[See Areal Geology.]	Robert E. Derkey
	[See Areal Geology.]	Robert E. Derkey
	[See Geochemistry, Mineralogy and Petrology.]	Robert E. Derkey
	[See Geochemistry, Mineralogy and Petrology.]	L. J. Drew
162	Preparation of a map showing mines, prospects and mineral occurrences in the Butte 1°x2° quadrangle. Also the development of ore deposit models to contribute to the mineral resource appraisal of the Butte quadrangle.	James E. Elliott, USGS, Denver, Colorado
	[See Geophysics.]	Donald P. Elston
163	Field studies of sulfide occurrences in the Stillwater Complex as part of a study of world nickel and cobalt resources—*continuing*.	M. P. Foose, USGS, Reston, Virginia
	[See Geochemistry, Mineralogy and Petrology.]	Martin Foote
	Titanium resources of the United States. Includes work on the titanium in porphyry metal deposits of the western U.S. [1985]	Eric R. Force, USGS, Reston, Virginia
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Don Herberger
	Evaluation of deposits of western bentonite including Montana deposits. [1985]	John W. Hosterman, USGS, Reston, Virginia
	Bedded Precambrian iron deposits of southwestern Montana. [1985]	Harold L. James, USGS, Port Townsend, Washington
*164	The nature and distribution of gold and associated vein mineralization at the Red Pine mine, western Tobacco Root Mountains. [1985]	Teresa Kinley, Montana State University
	[See Isotope Geology and Geochronology.]	Ian M. Lange Charles Naeser
165	Geological and geochemical studies of the Flathead mine in the Hog Heaven mining district.	Ian M. Lange University of Montana
166	Geology of chromite. Includes geochemical investigation of the Stillwater Complex. [September 1985]	Bruce R. Lipin, USGS, Reston, Virginia
	[See Geochemistry, Mineralogy and Petrology.]	I. S. McCallum, A. Boudreau, L. Criscenti, L. Raedeke, L. Haskin, P. Salpas
	Gold deposits in carbonate units of the Belt Supergroup. [1986]	Henry G. McClernan, Don C. Lawson, Montana Bureau of Mines and Geology
	Development of geochemical exploration techniques for stratabound Cu-Ag deposits in Montana. [October 1986]	Elwin L. Mosier, USGS, Denver, Colorado

Economic Geology (*continued*)

167	Mineralogical studies of silicates and sulfides in the Stillwater Complex. Also study of the early magmatic environment of the complex. [1985]	Norman J Page, USGS, Menlo Park, California
	[See Geochemistry, Mineralogy and Petrology.]	Mike Paseczyk, Alex Volborth
*168	Mineral resource assessment of the Dillon 1°x2° quadrangle. Includes a study of the volcanic rocks southwest of Dillon and their relationship to the thrust-faulted Paleozoic rocks and ore deposits of the Bannack, Blue Wing and Argenta districts, as well as study of a porphyry copper prospect in the volcanics. [1985]	Robert C. Pearson, USGS, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Forrest G. Poole
	[See Geophysics.]	William A. Randall, Jr.
	[See Isotope Geology and Geochronology.]	Robert O. Rye
	[See Areal Geology.]	Mitchell W. Reynolds
	[See Geophysics.]	Lawrence C. Rowan
	[See Isotope Geology and Geochronology.]	Robert O. Rye
	[See Geochemistry, Mineralogy and Petrology.]	John Saxton
	[See Geochemistry, Mineralogy and Petrology.]	Clifford R. Stanley
	[See Geochemistry, Mineralogy and Petrology.]	Graham R. Thompson
169	Paragenetic relationships, zoning and mineralogy of the Black Pine mine, Granite County. [Spring 1985]	Greg Zeihen, University of Arizona
	[See Geochemistry, Mineralogy and Petrology.]	Lester Zeihen

Energy

	[See Geochemistry, Mineralogy and Petrology.]	Theodore J. Armbrustmacher
170	Coal resources of the Culbertson 1:100,000-scale quadrangle. [1986]	Harold H. Arndt, USGS, Denver, Colorado
	[See Geophysics.]	Alfred H. Balch
	Evaluation of anomalous vitrinite reflectance in outcrops over known oil fields in Montana, Wyoming and Oklahoma as a tool for exploration. [1985]	Neely H. Bostick, USGS, Denver, Colorado
	National Coal Resources Data System (NCRDS). This is a program of the USGS, in cooperation with state agencies, to establish a national computerized coal data base—*continuing*.	Jannette L. Downey Butori, Edith M. Wilde, Montana Bureau of Mines and Geology

Energy (*continued*)

	Data collection, validation and entry in the National Coal Resource Data System (NCRDS) in cooperation with the Montana Bureau of Mines and Geology—*continuing*.	M. D. Carter, USGS, Denver, Colorado
	Construction of a preliminary oil generation model for the Bakken Formation in Montana and North Dakota. [1987]	Ronald R. Charpentier, USGS, Denver, Colorado
	[See Geochemistry, Mineralogy and Petrology.]	Jerry L. Clayton
	[See Isotope Geology and Geochronology.]	Donald A. Coates, Edward L. Heffern
171	Stratigraphic framework and coal correlation, Bull Mountain basin and nearby Tertiary basins.	Carol Waite Connor, USGS, Denver, Colorado
172	Geology and coal resources of the Terret Ranch area, Powder River County. [1986]	David Coppock, Bureau of Land Management, Billings
173	Geology and coal resources of the Tongue River area, northern Powder River. [1986]	David Coppock, Bureau of Land Management, Billings
	Samples of oil and gas collected from the Williston basin will be analyzed for organic carbon content and the results correlated with thermal maturation studies. [1987]	Anny B. Coury, USGS, Denver, Colorado
174	Geology and coal resources of Tertiary sediments, Birney 1:100,000-scale quadrangle, northwest Powder River basin, Montana. [1985]	William C. Culbertson, USGS, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	John A. Daniel, M. J. Bartholomew, Bob Murray
	Tertiary geology and uranium occurrence in the Powder River basin. [1985]	Norman M. Denson, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Pamela Dunlap Derkey
	Hydrocarbon field size-distribution studies for major reservoirs of upper Cretaceous, lower Cretaceous and Permian age in the Powder River basin. [1987]	Gordon L. Dolton, USGS, Denver, Colorado
175	Biogeochemical prospecting for petroleum. Includes analysis of samples from the Bell Creek field, Montana. [1985]	Terrence J. Donovan, USGS, Flagstaff, Arizona
	Aeromagnetic detection of diagenetic magnetite over oil fields. [1985]	Terrence J. Donovan, USGS, Denver, Colorado
	Environments of coal deposition in western interior coal basins. [1985]	Romeo M. Flores, USGS, Denver, Colorado
176	Coal resource assessment of the Terry Badlands Wilderness study area.	Judith S. Gassaway, USGS, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Donald L. Gautier

Energy (*continued*)

177	Geology and coal resources of the Kirby-Birney coal field, Big Horn and Powder River counties, northern Powder River basin. [1986]	Jim Gruber, Bureau of Land Management-Solid Minerals, Billings
	[See Stratigraphy, Sedimentary Petrology and Paleontology	R. B. Halley
178	Geology and coal resources of the Moorhead-East Moorhead coal field, Big Horn and Powder River counties. [1986]	Bill Hansen, Bureau of Land Management-Solid Minerals, Billings
179	Chemical data sets for soils and plants will be merged in order to study their correlation with subsurface petroleum deposits in the Bell Creek oil field, Powder River County. [1985]	M. C. D. Hendricks, USGS, Flagstaff, Arizona
	Water and energy resources in the Yellowstone River basin with emphasis on the Tongue River basin—*continuing*.	David H. Hickcox, Ohio Wesleyan University
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Roy Jensen
180	Coal geology of the Forsyth area. [1987]	Kim Manley, USGS, Denver, Colorado
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Edwin K. Maughan
	[See Areal Geology.]	Marguerite McClellan
	[See Areal Geology.]	Edward E. McGregor
181	Geology and coal resources of the Decker and Spring Creek coal areas, Big Horn County, northern Powder River basin. [1985]	John McKay, Bureau of Land Management-Solid Minerals, Billings
	Gas-bearing strata of mid-Cretaceous age in western Wyoming and adjacent areas. [1985]	E. A. Merewether, USGS, Denver, Colorado
	Reservoir studies of the Madison Group, disturbed belt, Montana. [1985]	Kathryn M. Nichols, USGS, Denver, Colorado
	Coal resources of the Northern Powder River basin. [September 1986]	W. W. Olive, USGS, Reston, Virginia
	Collection and compilation of geotechnical information on the Fort Union and Wasatch formations in the coal-mining areas of the Powder River basin. [1985]	Frank W. Osterwald, USGS, Denver, Colorado
*182	Oil and gas in overthrust terrains including the central and northern Tendoy Mountains, Beaverhead County. [1986]	William J. Perry, Jr., USGS, Reston, Virginia
	Geology and oil and gas resouce potential of the U.S. western overthrust belt. [1985]	Richard B. Powers, USGS, Denver, Colorado
	Remote sensing for uranium exploration in the Powder River basin. [1985]	Gary L. Raines, USGS, Denver, Colorado

Energy (*continued*)

	[See Structural Geology.]	Alan R. Roberts
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Henry W. Roehler
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Charles A. Sandberg
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	James W. Schmoker
	[See Stratigraphy, Sedimentary Petrology and Paleontology.]	Gary B. Schneider
	Chemical analysis and geologic evaluation of coal from western interior coal basins.	Frederick O. Simon, USGS, Reston, Virginia
183	A compilation of site-specific geothermal investigations including Jackson, Radersburg, White Sulphur Springs and Ennis. [December 1985]	John Sonderegger, Montana Bureau of Mines and Geology
	[See Geochemistry, Mineralogy and Petrology.]	Judi Todd, Doug Coe, Frank Diebold
184	Coal resource evaluation of the Baker, Glendive, Sidney and Wibaux 1:100,000-scale quadrangles.	Edith M. Wilde, Janette L. Downey Butori, Montana Bureau of Mines and Geology
	[See Structural Geology.]	Courtaney Williamson

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196	Hydrologic evaluation of the unconsolidated aquifer in the Clark Fork Valley of the Yellowstone River. [September 1985]	Julianne Levings, USGS, Helena, Montana
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*201	Reclamation techniques and the hydrogeology of agricultural land contaminated by heavy metals in Deer Lodge, Powell and Silver Bow counties. [1985]	Thomas J. Osborne, Terence E. Duaime, John L. Sonderegger, Montana Bureau of Mines and Geology
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