

STATE OF OHIO
FRANK J. LAUSCHE, Governor
DEPARTMENT OF NATURAL RESOURCES
A. W. MARION, Director
DIVISION OF GEOLOGICAL SURVEY
JOHN H. MELVIN, Chief

BULLETIN 52

Richard Carlton

BIBLIOGRAPHY OF OHIO GEOLOGY
1819 -- 1950

By
DOROTHY G. WATKINS

COLUMBUS
1953

STATE OF OHIO

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Director

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DIVISION OF GEOLOGICAL SURVEY

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INTRODUCTION

The new Bibliography of Ohio Geology, 1819-1950, contains both a bibliography and subject index of all the literature relating to the geology and mineral resources of the State. The earliest paper listed in the bibliography was published nearly twenty years before the advent of the first Geological Survey of Ohio in 1837. The most recent publications listed are those of 1950, with the exception of three bibliographies and several abstracts of unpublished theses, which were published in 1951.

The only forerunner of the current bibliography was published by the Ohio Geological Survey in 1906. The references contained in this early report have been revised and re-indexed in the current volume. A great number of references have been gathered from *Geologic Literature on North America, 1875-1918*, and *Bibliography of North American Geology*, published 1919-1952 as *United States Geological Survey Bulletins* 746, 747, 823, 937, 938, 949, 952, 968, 977, and 985. Additional references were found during the course of library research in the literature itself and in indexes to various periodicals.

In the bibliography the references are listed alphabetically by author. The publications of each author have been arranged chronologically according to year of publication, with no particular attention given to the order of papers published in the same year. For reference from the subject index, the publication dates have been placed before each title, with letters added where

several papers bear the same date. The bibliographic style used in citations and the general form of the bibliography and index have been patterned after the *Bibliography of North American Geology*. A list of abbreviations used in citations is given on page vi.

Supplements to the current bibliography will be published at intervals by the Ohio Geological Survey. In addition to new material the first supplement will contain titles of papers published prior to 1951 which have been overlooked in this initial compilation. Suggestions regarding omissions or errors will be greatly appreciated and may be addressed to the Chief, Ohio Division of Geological Survey, Orton Hall, Ohio State University, Columbus, Ohio.

The author wishes to express her sincere appreciation to Mr. John H. Melvin, Chief, Ohio Division of Geological Survey, who suggested and directed the project; to Miss Verna Van Velzer of the Orton Memorial Library for her willing assistance with the library research; to Miss Lois Campbell, Dr. Mildred F. Marple, Mr. Robert L. Alkire, Mr. William H. Smith, and Mr. Ralph J. Bernhagen for suggestions regarding the organization of the index for their specialized fields; to Miss Pauline Smyth and Miss Marlene Beile for their assistance in preparing the manuscript for publication; and especially to Dr. Aurèle La Rocque of the Department of Geology, Ohio State University, for his enthusiastic support in all phases of the project.

INTRODUCTION

Organization of the Index

Immediately following the bibliography or author index is a subject index, which is keyed to the literature cited in the bibliography by authors' last names and publication dates. Initials are used only where necessary to distinguish between two or more authors with the same name.

Main headings. The main headings in the index are subject headings of various types. They may be names of sub-divisions of geology (Glacial geology, Structure); geologic ages (Devonian, Pre-Cambrian); or specific subjects (Abrasives, Meteorites). Examples of main headings are the following:

Abrasives	Meteorites
Bibliography	Mineralogy
Brines	Ohio Geological Survey
Coal	Oil and gas
Devonian	Paleobotany
Drainage changes	Paleontology
Economic geology	Pennsylvanian
General geology	Petrology
Geologic maps	Salt
Geomorphology	Sand and gravel
Glacial geology	Soils
Ground water	Stratigraphy (general)

Cross references. A main heading may have only a cross reference to another main heading, with no entries listed at all:

Underground water: See Ground water.

Or a main heading may have a cross reference to related headings in addition to a list of entries.

Brines: See also Salt.

Drainage changes: See also Glacial geology.

A cross reference which begins See under, or See also under, indicates that the subject matter sought as a main heading will be found as a sub-heading under another main heading:

Beach erosion: See under Geomorphology.

Belmont Co.: See under General geology.

Clay: See also under the various geologic ages.

The names of Ohio counties, which are geographic headings rather than subject headings, have been entered as main headings only with the cross reference, See under

General geology. Geographic headings have been used primarily as sub-headings under the main subject headings. In order to find all the available material on a particular county, it will be necessary to start with the section headed General geology and follow the directions given in the accompanying cross references.

Sub-headings. There are two kinds of sub-headings under the main headings, geographic and subject.

Wherever possible the geographic headings are the names of Ohio counties. Less exact areas such as South-eastern Ohio, Central Ohio, and Northern Ohio have been used wherever it was impossible to name specific counties. The sub-heading General describes publications which deal with Ohio as a whole.

A number of reports are concerned with the geology of a particular U. S. Geological Survey quadrangle, which is a map area bounded by meridians and parallels rather than by county or township boundaries. Such reports are indexed under both the quadrangle name and the names of the counties which the quadrangle covers. A report on the geology of an urban area appears both under the name of the city and the county in which it is located.

Closely related subjects have been grouped together as sub-headings under one main subject heading. For example, the names of Ohio minerals are listed under Mineralogy; various rock types, under Petrology; the glacial phenomena, under Glacial geology; the names of oil and gas fields, under Oil and gas, Fields and pools; and the various classes of animals, under Paleontology.

A cross reference following a sub-heading may direct the reader to other sub-headings under the same main heading:

Glacial geology:

Erratic boulders: See Glacial erratics.

Glacial boundary: See also Moraines.

If it is necessary for the reader to look for a sub-heading under another main heading, the cross reference will tell the reader where to look:

Glacial geology:

Ground water, glacial drift as source: See under Ground Water.

INTRODUCTION

Suggestions on Using the Index

The following examples will describe suggested methods of searching for information on several sample subjects.

Coal in Belmont County. To find information on a specific subject in a particular area, first look up the subject; then look for the area as a sub-heading under the main subject heading. All the major references to coal in Belmont County are listed as follows:

Coal: See also Pennsylvanian; Permian,
Belmont Co.: Andrews, 1874; Bownocker,
1917, 1929; Brown, C.N., 1888; etc.

The cross reference after the main heading Coal suggests that additional information may be found under the main headings Pennsylvanian and Permian, the geologic ages of the coal-bearing rocks of Ohio.

General geology and mineral resources of Belmont County. All county reports and papers of a general nature are listed by geographic area under General geology. The cross reference after General geology suggests other important main headings under which general information on the counties may be found:

General geology: See also Economic geology;
Geomorphology; Glacial geology;
Paleontology; Stratigraphy; Structure;
and the various geologic ages.
Belmont Co.: Andrews, 1874; Atwater,
1819a; Eberle, 1936, 1937; etc.

The first suggestion given in the cross reference indicates where information on economic geology or mineral resources may be found:

Economic geology: See also the names of
specific mineral resources and products,
Belmont Co.: Andrews, 1874; Condit, 1923;
Mitchell, 1929; etc.

If the reader were to look up Mineral resources instead of Economic geology, he would find the following note:

Mineral resources: See Economic geology; see
also the names of specific mineral
resources and products.

Information on the stratigraphy or bedrock geology of Belmont County may be found by looking up the geologic ages of the rocks which appear at the surface in the county. The ages of the rocks (Pennsylvanian and Permian) may be determined by consulting the position of Belmont County on the geologic map of Ohio on page 2.

Mississippian Brachiopoda. Paleontological information is classified under three main headings: Paleobotany; Paleontology, invertebrate; and Paleontology, vertebrate. To find information on Brachiopoda, a particular class of invertebrate animals, look first for the name of the class under Paleontology, invertebrate. This approach will give the reader all the major sources of information on Brachiopoda of all ages, including Mississippian:

Paleontology, invertebrate:
Brachiopoda:
Mississippian: Girty, 1939; Hall, J., 1863;
Herrick, 1888a; etc.

The papers listed under the sub-heading Mississippian (under Paleontology, invertebrate), are all of a general nature; they concern Mississippian faunas rather than any particular class of animals. The reader may want to refer to these general papers to see if they contain any additional information on Mississippian Brachiopoda:

Paleontology, invertebrate:
Mississippian (general): See also the
various classes of animals,
Bucher, 1929; Carman, 1947; Cooper,
W.F., 1888, 1890, 1900; etc.

Stratigraphy of the Berea sandstone in Ohio. Before looking up the name of a stratigraphic horizon such as Berea sandstone, it is necessary to know the geologic age of the horizon. Reference to the geologic map of Ohio on page 2 will aid the reader in understanding the geologic age sequence of the layered rocks of Ohio.

Because of the magnitude and diversity of the stratigraphic information in the current index, it has been necessary (1) to list all papers on the stratigraphy of the state as a whole under Stratigraphy (general), and (2) to list all other stratigraphic papers under the geologic ages of the strata described. The cross reference following the heading Stratigraphy (general) clarifies this situation:

Stratigraphy (general): See also Cambrian;
Devonian; Mississippian; Ordovician; Penn-
sylvanian; Permian; Pre-Cambrian; Silurian;

The following information will be found under Mississippian, the geologic age of the Berea sandstone:

Mississippian (Stratigraphic geology):
Berea sandstone: See also under Oil and gas,
Bownocker, 1915; Burroughs, 1913, etc.

Information on the Berea sandstone as an oil and gas horizon will be found, according to the cross reference, under Oil and gas.

ABBREVIATIONS

Abst.	Abstract, abstracts
Acad. Nat. Sci. Phila.	Academy of Natural Sciences of Philadelphia
Ala. Acad. Sci.	Alabama Academy of Science
Albany Inst.	Albany Institute
Am. Acad. Arts Sci.	American Academy of Arts and Sciences
Am. Assoc. Adv. Sci.	American Association for the Advancement of Science
Am. Assoc. Petrol. Geol.	American Association of Petroleum Geologists
Am. Ceramic Soc.	American Ceramic Society
Am. Chem.	American Chemist
Am. Cong. Surveying and Mapping	American Congress of Surveying and Mapping
Am. Geol.	American Geologist
Am. Geophys. Union	American Geophysical Union
Am. Inst. Min. Met. Eng.	American Institute of Mining and Metallurgical Engineers
Am. Inst. Mining Eng.	American Institute of Mining Engineers
Am. Jour. Botany	American Journal of Botany
Am. Jour. Sci.	American Journal of Science
Am. Micro. Soc.	American Microscopic Society
Am. Mid. Nat.	American Midland Naturalist
Am. Mineralogist	American Mineralogist
Am. Mus. Jour.	American Museum Journal
Am. Mus. Nat. Hist.	American Museum of Natural History
Am. Nat.	American Naturalist
Am. Petrol. Inst.	American Petroleum Institute
Am. Philos. Soc.	American Philosophical Society
An.	Annals
An. Botany	Annals of Botany
An. Iowa	Annals of Iowa
An. Mag. Nat. Hist.	Annals and Magazine of Natural History
An. Sci., Cleve.	Annals of Science, Cleveland
Ann. Rept.	Annual Report
Ann. Sci. Discovery (Wells)	Annual Scientific Discovery (Wells)
app.	appendix
Appalachian Geol. Soc.	Appalachian Geological Society
art.	article
Assoc. Am. Geog.	Association of American Geographers
Assoc. Am. Geol.	Association of American Geologists and Naturalists
Bd.	Board; Band (German)
Biog. Mem.	Biographical Memoir
Biol. Soc. Wash.	Biological Society of Washington, D.C.
Boston Jour. Nat. Hist.	Boston Journal of Natural History
Boston Soc. Nat. Hist.	Boston Society of Natural History
British Assoc. Adv. Sci.	British Association for the Advancement of Science
Bull.	Bulletin
Can. Nat.	Canadian Naturalist and Geologist and Proceedings of the Natural History Society of Montreal
Can. Rec. Sci.	Canadian Record of Science

ABBREVIATIONS

Carnegie Inst. Tech.	Carnegie Institute of Technology
Carnegie Mus.	Carnegie Museum
Central Ohio Sci. Assoc.	Central Ohio Scientific Association of Urbana, Ohio
Chicago Acad. Sci.	Chicago Academy of Sciences
Chicago, Univ., Abst. Theses	Chicago, University, Abstracts of Theses
Cin. Mus. Nat. Hist.	Cincinnati Museum of Natural History
Cin. Quar. Jour. Sci.	Cincinnati Quarterly Journal of Science
Cin., Univ., Inst. Sci. Research	Cincinnati, University, Institute of Scientific Research
Cin., Univ., Teachers' Bull.	Cincinnati, University, Teachers' Bulletin
Circ.	Circular
Cleve. Acad. Nat. Sci.	Cleveland Academy of Natural Science
Cleve. Eng. Soc.	Cleveland Engineering Society
Cleve. Mus. Nat. Hist.	Cleveland Museum of Natural History
Colliery Eng.	Colliery Engineer
Conf.	Conference
Cong. Strat. Carbonifère Heerlen	Congrès pour L'avancement Des Etudes de Stratigraphie Carbonifère Heerlen
Contr.	Contributions
Denison Univ. Sci. Lab.	Denison University, Scientific Laboratories
Doc.	Document
Doc. Dissert.	Doctoral Dissertations
Eclogae Geol. Helvetiae	Eclogae Geologicae Helvetiae
Econ. Geol.	Economic Geology
ed.	edition
Edinb. Geol. Soc.	Edinburgh Geological Society
Edinb. New Philos. Jour.	Edinburgh New Philosophical Journal
Eng. Exp. Sta.	Engineering Experiment Station
Eng. Mining Jour.	Engineering and Mining Journal
Exec. Doc.	Executive Document
fig., figs.	figure, figures
geog.	geographic, geographical
Geog. Rev.	Geographical Review
Geog. Soc. Phila.	Geographical Society of Philadelphia
geol.	geologic, geological
Geol. Mag.	Geological Magazine
geol. ser.	geological series
Geol. Soc. Amer.	Geological Society of America
Geol. Soc. London	Geological Society of London
Gesell. Erdkunde Berlin, Zeitschr.	Gesellschaft Erdkunde Berlin, Zeitschrift
Harvard Coll. Mus. Comp. Zool.	Harvard College, Museum of Comparative Zoology
Harvard Univ. Bot. Mus.	Harvard University, Botany Museum
House Doc.	House Document
il.	illustrated
Ill. Acad. Sci.	Illinois Academy of Science
Ill. Geol. Survey	Illinois Geological Survey
Ill. St. Mus. Nat. Hist.	Illinois State Museum of Natural History
incl.	including, includes
Ind. Acad. Sci.	Indiana Academy of Science
Ind. Dept. Geol. Nat. Hist.	Indiana, Department of Geology and Natural History
Ind. Dept. Geol. Nat. Res.	Indiana, Department of Geology and Natural Resources
Ind. Geol. Survey	Indiana Geological Survey
Info. Circ.	Information Circular
Inv.	Investigations
Iowa Acad. Sci.	Iowa Academy of Science
Jour.	Journal

ABBREVIATIONS

Jour. Geog.	Journal of Geography
Jour. Geol.	Journal of Geology
Jour. Geomorphology	Journal of Geomorphology
Jour. Mammalogy	Journal of Mammology
Jour. Paleo.	Journal of Paleontology
Jour. Sed. Petrol.	Journal of Sedimentary Petrology
Kans. Acad. Sci.	Kansas Academy of Science
Kans. Geol. Soc.	Kansas Geological Society
Kansas City Rev. Sci.	Kansas City Review of Science and Industry
K.-Preuss. Akad. Wiss., Berlin, Szb.	Königlich-preussische Akademie der Wissenschaften zu Berlin, Sitzungsberichte
Ky. Acad. Sci.	Kentucky Academy of Science
Ky. Geol. Survey	Kentucky Geological Survey
Lyc. Nat. Hist. N.Y.	Lyceum of Natural History of New York
Mag. Western Hist.	Magazine of Western History
Mem.	Memoir
Mich. Acad. Sci.	Michigan Academy of Science, Arts and Letters
Mich. Geol. Survey	Michigan Geological Survey
Mich. Min. Soc. Yrbk.	Michigan Mineralogical Society Yearbook
Mich., Univ., Mus. Paleo.	Michigan, University, Museum of Paleontology
Midwest Geol.	Midwest Geologist
Mining Eng.	Mining Engineer
Mining Mag.	Mining Magazine
Minn. Geol. Survey	Minnesota Geological Survey
Minn. Univ. Quar. Bull.	Minnesota University, Quarterly Bulletin
Misc. Publ.	Miscellaneous Publication
Mitt.	Mitteilungen
Mo. Univ.	Missouri University
Mon.	Monograph
Mtg.	Meeting
Mus.	Museum
Mus. royal histoire nat. Belgique	Musée royal d'histoire Naturelle de Belgique
n.s.	new series
N. Y. Acad. Sci.	New York Academy of Sciences
N. Y. Geol. Survey	New York Geological Survey
N. Y. St. Cab., Ann. Rept.	New York State Cabinet of Natural History, Annual Report of the Regents of the University
N. Y. St. Geol.	New York State Geologist
N. Y. St. Mus. Nat. Hist.	New York State Museum of Natural History
N. Y. St. Nat. Hist. Survey	New York State Natural History Survey
Nat.	National, Natural, Naturalist
Nat. Acad. Sci., Biog. Mem.	National Academy of Science, Biographical Memoir
Nat. Geog. Mag.	National Geographic Magazine
Nat. Hist.	Natural History
Nat. Inst., Bull. Proc.	National Institution (later, Institute) for the Promotion of Science, Bulletin of the Proceedings
Nat. Petrol. News	National Petroleum News
Nat. Research Council	National Research Council
Neues Jahrb., Beil. Bd.	Neues Jahrbuch für Mineralogie, Geologie, und Paläontologie, Beilage Band.
no.	number
Ohio Acad. Sci.	Ohio Academy of Science
Ohio Agri. Exp. Sta.	Ohio Agricultural Experiment Station
Ohio Arch. and Hist. Publ.	Ohio Archaeological and Historical Publications
Ohio Coal Assoc.	Ohio Coal Association

ABBREVIATIONS

Ohio Devel. and Publ. Comm.	Ohio Development and Publicity Commission
Ohio Geol. Survey	Ohio Geological Survey
Ohio Jour. Sci.	Ohio Journal of Science
Ohio Mining Jour.	Ohio Mining Journal
Ohio Nat.	Ohio Naturalist
Ohio, Sec. State	Ohio, Secretary of State
Ohio St. Acad. Sci.	Ohio State Academy of Science
Ohio St. Univ. Abst. Doc. Dissert.	Ohio State University, Abstracts of Doctoral Dissertations
Ohio St. Univ. Abst. Masters' Theses	Ohio State University, Abstracts of Masters' Theses
Ohio St. Univ. Bull.	Ohio State University Bulletin
Ohio St. Univ., Eng. Exp. Sta.	Ohio State University, Engineering Experiment Station
Ohio Water Res. Bd.	Ohio Water Resources Board
Ohio Water Supply Bd.	Ohio Water Supply Board
Oil and Gas Jour.	Oil and Gas Journal
Okla. Acad. Sci.	Oklahoma Academy of Science
Ottawa Nat.	Ottawa Naturalist
p.	page, pages
Pa. Geol. Survey, 2d	Pennsylvania Geological Survey, Second Organization
Paleo. Bull. (Cope)	Paleontological Bulletins (Cope)
paleogeog.	paleogeographic
Pan-Am. Geol.	Pan-American Geologist
Petermann's Mitt.	Petermann's Mitteilungen
Pharmaceutical Jour.	Pharmaceutical Journal
Philos. Soc. Glasgow	Philosophical Society of Glasgow
Philos. Soc. Wash.	Philosophical Society of Washington (D.C.)
physiogr.	physiographic
pl., pls.	plate, plates
Pop. Publ.	Popular Publication
Pop. Sci. Mo.	Popular Science Monthly
port.	portrait
priv. publ.	private publication
Proc.	Proceedings
Prof. Paper	Professional Paper
pt.	part
publ., Publ.	publication, Publicity
Quar. Jour.	Quarterly Journal
Rept.	Report
Rept. Inv.	Report of Investigations
Rept. Prog.	Report of Progress
Rev.	Review, reviewed
Rochester Acad. Sci.	Rochester Academy of Science
Russ.-k. Min. Ges. St. Petersburg, Verh.	Russisch-kaiserliche mineralogische Gesellschaft zu St. Petersburg, Verhandlungen
Sch. Mines Quar.	School of Mines Quarterly
Sci. Am.	Scientific American
Sci. Am. Suppl.	Scientific American Supplement
Sci. Publ.	Scientific Publication
sci. ser.	science series
sec.	section
Seismol. Soc. Amer.	Seismological Society of America
ser.	series
Smiths. Contr. Knowl.	Smithsonian Contributions to Knowledge
Smiths. Inst. Misc. Coll.	Smithsonian Institute, Miscellaneous Collection
Soc. Géol. France	Société Géologique de France
Soc. Research on Meteorites	Society for Research on Meteorites

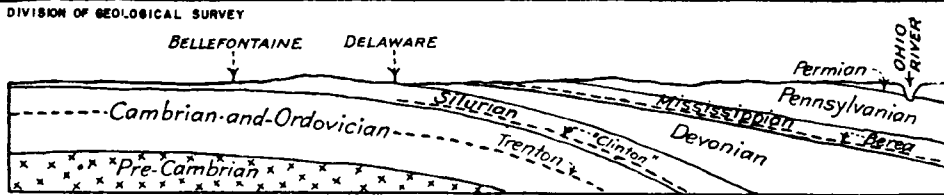
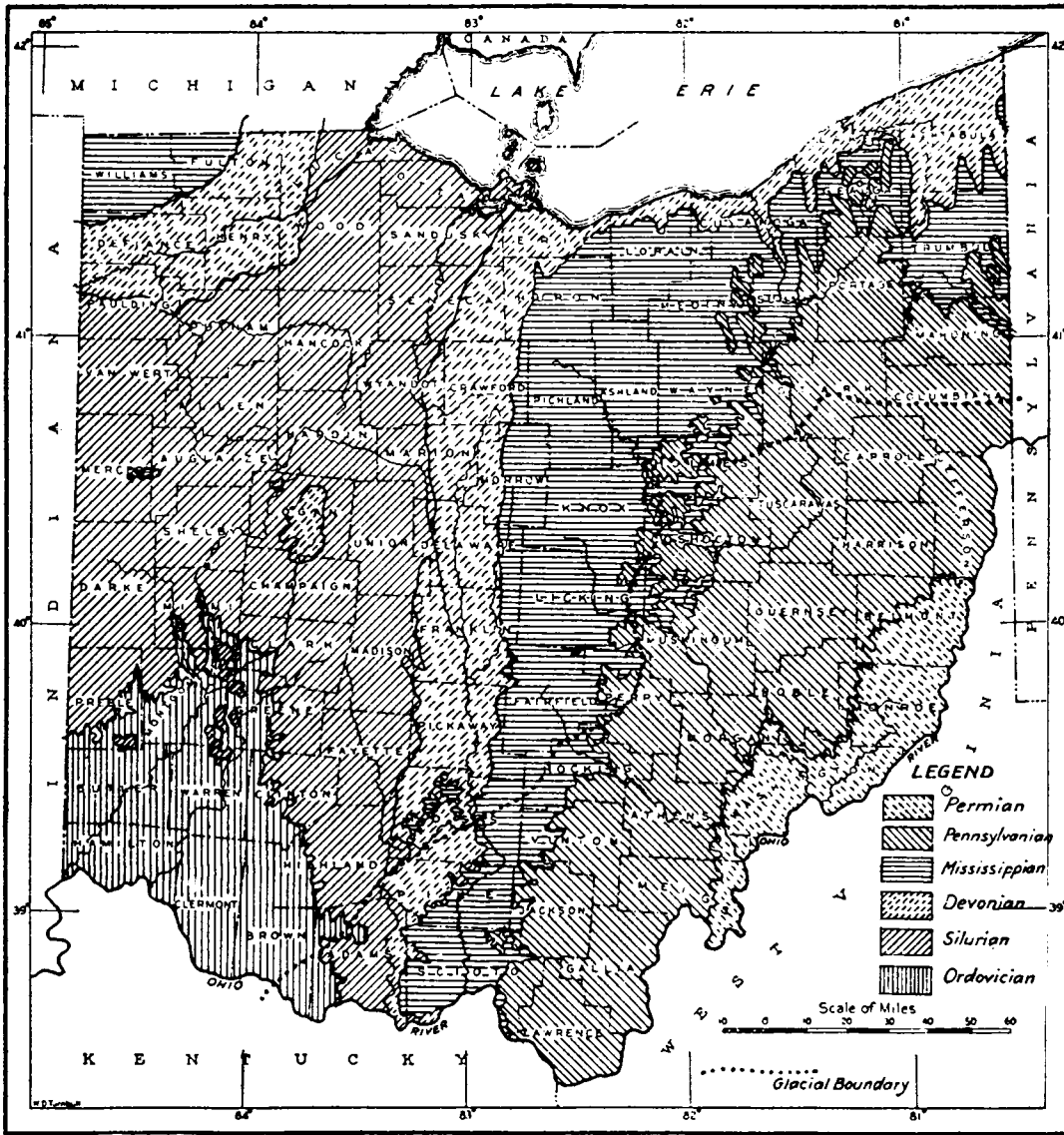
ABBREVIATIONS

Spec. Circ.	Special Circular
Spec. Paper	Special Paper
Suppl.	Supplement
Tech.	Technical, Technology
topog.	topographic
Torrey Bot. Club	Torrey Botanical Club
Trans.	Transactions
transl.	translated, translation
U. S. Bur. Mines	United States Bureau of Mines
U. S. Dept. Agri., Bur. Soils	United States Department of Agriculture, Bureau of Soils
U. S. Geol. Survey	United States Geological Survey
U. S. Nat. Mus.	United States National Museum
Univ.	University
vol.	volume
W. Va. Geol. Survey	West Virginia Geological Survey
Wash. Acad. Sci.	Washington Academy of Sciences
Western Mo. Mag.	Western Monthly Magazine
Western Reserve Hist. Soc.	Western Reserve Historical Society
Wis. Acad. Sci.	Wisconsin Academy of Science, Arts, and Letters

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ECONOMIC GEOGRAPHY OF OHIO



GEOLOGIC MAP OF OHIO

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Bureau of Chemistry and Soils
Soil Surveys have been completed for the following areas. Each report is accompanied by a soil map.
- Counties:
- | | | |
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| Adams | Belmont | Clermont |
| Athens | Brown | Coshocton |
| Auglaize | Butler | Fulton |

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Soil Surveys - continued

Counties: - continued

Geauga	Miami	Scioto
Lake	Muskingum	Stark
Licking	Ottawa	Trumbull
Logan	Paulding	Vinton
Lucas	Putnam	Washington
Marion		

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 Wright, G. F.: Hubbard, 1923; Upham, 1922.
- Black shales: See under Shale.
- Blaine Hill section: White, G. W., 1945a.
- Blue Hole: Stout, 1949; Ver Steeg, 1932b.
- Brines: See also Salt.
- Analyses: Stout, 1932, 1941a; Wormley, 1874.
- Athens Co.: Andrews, 1874; Briggs, 1838; Hildreth,
 1838; Stout, 1941a.
- Barium in brines: Heck, 1940.
- Brine-bearing strata: Stout, 1932.
- Bromine in brines: Orton, 1885a; Root, 1888.
- Columbiana Co.: Orton, 1885a; Root, 1888.
- Cuyahoga Co.: Orton, 1886e.
- Delaware Co.: Hildreth, 1838; Stout, 1940b.
- Gallia Co.: Hildreth, 1838.
- General: Baltimore & Ohio R.R., 1948; Carney,
 1910b; Gambs, 1946; Stout, 1932.
- Guernsey Co.: Andrews, 1874; Orton, 1885a;
 Root, 1888.
- Hocking Valley: Stout, 1941a.
- Jackson Co.: Briggs, 1838; Hildreth, 1838.
- Meigs Co.: Andrews, 1874; Hildreth, 1838; Orton,
 1885a; Root, 1888; Stout, 1940c.
- Morgan Co.: Andrews, 1874; Hildreth, 1838;
 Root, 1888.
- Muskingum Co.: Andrews, 1874; Hildreth, 1838.
- Noble Co.: Andrews, 1874.
- Origin: Lord, R.C., 1928.
- Perry Co.: Andrews, 1874.
- Southeastern Ohio: Andrews, 1865; Hildreth,
 1833; Phalen, 1919.
- Tuscarawas Co.: Orton, 1885a; Root, 1888.
- Bromine: Orton, 1885a.
- Brown Co.: See under General geology.
- Buckeye Lake, physiographic study: Detmers, 1912.
- Building stone: See also Limestone; Sandstone.
- Adams Co.: Andrews, 1891.
- Cuyahoga Co.: Cushing, 1931.
- Erie Co.: Carney, 1911.
- General: Bownocker, 1915; Carney, 1910b;
 Hawes, 1884; Merrill, G.P., 1889; Ohio
 Chamber of Commerce, 1949; Ohio Devel.
 & Publ. Comm., 1944.
- Greene Co.: Orton, 1874.

Building stone: - continued

- Lorain Co.: Burroughs, 1913; Carney, 1911; Cushing,
 1931; Newberry, 1874b.
- Medina Co.: Cushing, 1931.
- Pike Co.: Orton, 1874.
- Ross Co.: Orton, 1874.
- Scioto Co.: Andrews, 1891.
- Summit Co.: Cushing, 1931.
- Buried topography: See Drainage changes; Glacial
 geology.
- Butler Co.: See under General geology.
- Cambrian:
- Ashland Co.: Fettke, 1948.
- Clark Co.: Wasson, 1932.
- Delaware Co.: Pye, 1946; Stout, 1940b.
- General: Cohee, 1948; Lafferty, 1941; Lamborn,
 1934; Stout, 1944e, f; U.S.G.S., 1945b.
- Hancock Co.: Condit, 1913.
- Northwestern Ohio: Fettke, 1950.
- Pike Co.: Bassler, 1911.
- Putnam Co.: Fettke, 1948.
- Carboniferous: See Mississippian; Pennsylvanian;
 Permian.
- Carroll Co.: See under General geology.
- Caves and caverns: See under Geomorphology.
- Cedar Falls: Ver Steeg, 1933.
- Cement materials: Anderson, 1950; Bleininger, 1904;
 Carney, 1910b; Eckel, 1913; Lord, N.W., 1888;
 Ohio Chamber of Commerce, 1949; Orton, Jr.,
 1904.
- Champaign Co.: See under General geology.
- Chillicothe test core: Carman, 1947.
- Cincinnati arch: See under Structure.
- Clark Co.: See under General geology.
- Clay: See also under the various geologic ages.
- Analyses: Lamborn, 1938; Orton, Jr., 1884; Stout,
 1923, 1931, 1940.
- Ceramic industries: Orton, Jr., 1884, 1893;
 Worcester, 1910.
- Clarion clay: See under Pennsylvanian.
- Coal-formation clays: Orton, 1893b; Orton, Jr.,
 1884; Stout, 1923, 1939a.
- Columbiana Co.: Stout, 1924.
- Cuyahoga Co.: Cushing, 1931; Van Horn, 1916.
- Delaware Co.: Westgate, 1926.
- Eastern Ohio: Hice, 1905.
- Foundry bond clay: Dunbeck, 1947.
- Gallia Co.: Stout, 1916.
- General: Bleininger, 1904; Carney, 1910b; Ever-
 hart, 1949; Lamborn, 1938; Ohio Devel. &
 Publ. Comm., 1944; Orton, 1893b; Orton, Jr.,
 1884, 1893.
- Glacial drift clays: Lamborn, 1938; Orton, Jr.,
 1884.
- Glass-pot clays: Stout, 1922.
- History of development of clay industry: Stout, 1923.

Clay: - continued

- Hocking Co.: Lovejoy, 1888a; Merrill, W.M., 1948, 1949, 1950.
 Holmes Co.: White, G.W., 1949.
 Jackson Co.: Stout, 1916, 1940.
 Jefferson Co.: Lamborn, 1930.
 Lawrence Co.: Maxey, 1940, 1940a; Stout, 1916, 1922, 1931.
 Lorain Co.: Cushing, 1931.
 Medina Co.: Cushing, 1931.
 Muskingum Co.: Stout, 1918; Wheeler, 1889.
 Origin of coal-formation clays: Stout, 1923.
 Perry Co.: Flint, N.K., 1948, 1949.
 Pike Co.: Stout, 1916.
 Refractory clays: Bognar, 1935; Stout, 1929, 1930a.
 Scioto Co.: Stout, 1916.
 Summit Co.: Cushing, 1931.
 Surface clays: Lamborn, 1938.
 Tile, manufacture of: See Ceramic industries.
 Tuscarawas Co.: Newberry, 1878a.
 Vinton Co.: Stout, 1932a, 1940.
 Wayne Co.: Conrey, 1921.
 Clermont Co.: See under General geology.
 Clinton Co.: See under General geology.
 Coal: See also Pennsylvanian; Permian.
 Allegheny coal field: Andrews, 1875a; Roy, 1876b; Whittlesey, 1854, 1874, 1876.
 Allegheny formation, coals of: Orton, 1884a.
 correlation: Thiessen, 1924.
 Analyses: Bownocker, 1908, 1929; Condit, 1923; Dean, E.S., 1949; Fieldner, 1923; Mendenhall, T.C., 1871; Newberry, 1874n.
 Appalachian coal field: Rogers, H.D., 1843; White, I. C., 1891.
 Athens Co.: Andrews, 1871a, 1873, 1878; Bownocker, 1917, 1929; Briggs, 1838, 1838a; Lovejoy, 1888; Orton, 1884a, 1889a; Read, 1878b.
 Bedford cannel coal: Orton, Jr., 1884a.
 Belmont Co.: Andrews, 1874; Bownocker, 1917, 1929; Brown, C.N., 1888; Condit, 1923; Eberle, 1936, 1937; Lesquereux, 1852; Mitchell, 1929; Schaefer, J.E., 1928; Stevenson, 1878; White, G.W., 1947a; Whittlesey, 1869a.
 Bibliography: Berryhill, 1951; Stratton, 1950.
 Caldwell quadrangle: White, G.W., 1947b.
 Cannel coal: Ashley, 1918; Case, 1917; Newberry, 1857a; Ohio Devel. & Publ. Comm., 1944; Orton, Jr., 1884a; Silliman, 1859; Tappan, 1830.
 Carroll Co.: Bownocker, 1917, 1929; Lamborn, 1942; Orton, 1884a; Stevenson, 1878; Whittlesey, 1879b.
 Clarion coal: Bownocker, 1908.
 Coal fields of Ohio, description of: Bownocker,

Coal: - continued

- Coal fields of Ohio: - continued
 1917, 1929.
 map: Orton, 1893d.
 Coal geology, problems of: Orton, 1886c.
 Coal seams of Ohio: Bownocker, 1917, 1929.
 Allegheny formation: Orton, 1884a.
 Conemaugh formation: Condit, 1912a.
 Monongahela formation: Bownocker, 1908.
 Pottsville formation: Orton, 1884a.
 boulders in: Hicks, 1879; Marsh, 1872; Orton, 1892; White, C.A., 1871; Winchell, A., 1871a.
 causes of wants in: Roy, 1882.
 faulting in: Huston, 1883.
 "horsebacks" in: Haseltine, 1883.
 identification of: Roy, 1887.
 irregularities of: Roy, 1887a, 1888.
 map showing outcrop boundaries: Orton, 1893d.
 parallelism of: Andrews, 1874a; Newberry, 1874d; Stevenson, 1875.
 Coke manufacture, suitability of Ohio coals for: Bancroft, 1887; Stout, 1919, 1919a.
 Columbiana Co.: Bownocker, 1917, 1929; Newberry, 1878a; Orton, 1884a; Silliman, 1859; Stout, 1924; Sturgeon, 1943, 1944; Whittlesey, 1869a, 1874a, 1879b, 1880.
 Conemaugh formation, coals of: Condit, 1912a.
 Constitution: Orton, 1884e.
 Copiapite in coal: McCaughey, 1918.
 Correlation: See also under Pennsylvanian.
 Kosanke, 1943a; Thiessen, 1923, 1924; Wanless, 1916.
 Coshocton Co.: Bownocker, 1917, 1929; Hildreth, 1837; Hodge, 1878; Orton, 1884a; Orton, Jr., 1884a; Whittlesey, 1879b.
 Cumberland quadrangle: White, G.W., 1947b.
 Fields: See Coal fields.
 Gallia Co.: Andrews, 1873; Bownocker, 1917, 1929; Briggs, 1838; Lovejoy, 1888; McMillin, 1881; Orton, 1884a; Stout, 1916.
 Gas coals: McMillin, 1884, 1884a.
 Geauga Co.: Sturgeon, 1945.
 General: See also Coal seams.
 Ashley, 1905; Bownocker, 1917, 1929; Burroughs, 1913b; Burrows, 1915; Campbell, 1923; Carney, 1910b; Fieldner, 1923; Haseltine, 1902; Mather, W.W., 1838b; Newberry, 1871, 1874a; Ohio Chamber of Commerce, 1949; Ohio Coal Assoc., 1945; Ohio Devel. & Publ. Comm., 1944; Orton, 1883c, 1884a, 1886a, 1893c; Roy, 1876, 1884, 1885, 1890; Stout, 1919, 1930b, 1944d, 1945c; White, I. C., 1891.
 Guernsey Co.: Andrews, 1874; Bownocker, 1917, 1929; Brown, C.N., 1884, 1888; Condit, 1923;

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- Guernsey Co.: - continued
 Mix, 1918; Nesbitt, 1930, 1930a; Orton, 1884a; Schaefer, J.E., 1928; Stevenson, 1878; Tappan, 1830; White, G.W., 1947b.
- Harrison Co.: Bownocker, 1917, 1929; Stevenson, 1878; White, G.W., 1947a.
- History of development in Ohio: Bancroft, 1888; Eavenson, 1938; Roy, 1884; Stout, 1944d; Whittlesey, 1883.
- Hocking Co.: Andrews, 1871a, 1878; Bownocker, 1917, 1929; Briggs, 1838, 1838a; Merrill, W.M., 1948, 1949, 1950; Orton, 1878b, 1884a, 1889a; Read, 1878b; Whittlesey, 1873a, 1877a.
- Hocking Valley coal field: Burroughs, 1914a; Hunt, 1874, 1874a, 1879; Jennings, 1887; Orton, 1889a; Read, 1878b.
- Holmes Co.: Bownocker, 1917, 1929; Orton, 1884a; Read, 1871, 1878a; White, G.W., 1949.
- Jackson Co.: Bownocker, 1917, 1929; Briggs, 1838; Ede, 1895; Orton, 1878b, 1884a; Roy, 1883, 1884a, 1885a, 1894, 1899; Stout, 1916.
- Jackson shaft coal: See Quakertown (No. 2) coal.
- Jefferson Co.: Bownocker, 1917, 1929; Brown, C.N., 1888; Lamborn, 1930; Newberry, 1878b; Orton, 1884a; White, G.W., 1947a; Whittlesey, 1869a.
- Jointing in coal beds: Ver Steeg, 1942a.
- Kenova quadrangle: Phalen, 1906, 1908, 1912.
- Lawrence Co.: Bownocker, 1917, 1929; Briggs, 1838; McMillin, 1881; Maxey, 1940, 1940a; Orton, 1878b, 1884a; Phalen, 1906, 1908, 1912; Stout, 1916.
- Licking Co.: Bownocker, 1917, 1929; Hildreth, 1837; Orton, 1884a; Turkopp, 1915.
- Lower Kittanning coal: Bownocker, 1908.
- Mahoning Co.: Bownocker, 1917, 1929; Hildreth, 1837; Lamborn, 1942; Newberry, 1878b; Orton, 1884a; Stephenson, 1933, 1934; Sturgeon, 1943, 1944; Whittlesey, 1838a, 1869a.
- Mahoning coal field: Haseltine, 1885; Roy, 1876a.
- Map of Ohio coal fields: Orton, 1893d.
- Massillon coal field: Orton, 1884a, f.
- Medina Co.: Bownocker, 1929; Orton, 1884a, f.
- Meigs Co.: Andrews, 1873; Bownocker, 1917, 1929; Lesquereux, 1852; Lovejoy, 1888; Stout, 1940c.
- Meigs Creek (No. 9) coal: Andrews, 1864; Bownocker, 1908; Brown, C.N., 1884; Condit, 1923.
 map: White, G.W., 1947b.
- Microfossils: Cross, A.T., 1950, 1950a; Hoskins, 1941; Kosanke, 1943, 1943a; Thiessen, 1923, 1924.
- Middle Kittanning (No. 6) coal: Andrews, 1871a, 1878; Bownocker, 1908; Flint, N.K., 1948,

Coal: - continued

- Middle Kittanning (No. 6) coal: - continued
 1949; Orton, 1884a; Read, 1878b; Stout, 1918; Sturgeon, 1944; Whittlesey, 1872a, 1873a, 1875, 1877a.
- Mining, extent of: Jennings, 1887; Sisler, 1925.
 methods and developments: Orton, 1884a; Roy, 1876, 1883b, 1884d, 1890.
- Monongahela formation, coals of: Bownocker, 1908; Stout, 1930.
 correlation: Thiessen, 1923.
- Monroe Co.: Arkle, 1950, 1951; Bownocker, 1917, 1929; Condit, 1923.
- Morgan Co.: Andrews, 1873; Bownocker, 1917, 1929; Brown, C.N., 1884; Lovejoy, 1888; White, G.W., 1947b.
- Muskingum Co.: Andrews, 1873; Bownocker, 1917, 1929; Brown, C.N., 1884; Foster, 1838; Lesquereux, 1852; Mix, 1918; Orton, 1884a; Stevenson, 1878; Stout, 1918; Turkopp, 1915; Wheeler, 1889; White, G.W., 1947b; Whittlesey, 1879b.
- Muskingum Valley: Hildreth, 1836.
- Noble Co.: Andrews, 1874; Bownocker, 1917, 1929; Brown, C.N., 1884; Condit, 1923; White, G.W., 1947b.
- Northeastern Ohio: Lesquereux, 1852; Newberry, 1857, 1871b; Whittlesey, 1853.
- Ohio Valley: Hildreth, 1836.
- Origin: Newberry, 1883; Rogers, H.D., 1843.
- Parallelism of coal seams: Andrews, 1874a; Newberry, 1874d; Stevenson, 1875.
- Perry Co.: Andrews, 1871a, 1878; Bowen, 1947, 1948; Bownocker, 1917, 1929; Flint, N.K., 1948, 1949; Foster, 1851; Hyde, 1912a; Mather, W.W., 1853; Orton, 1884a; Read, 1878b; Whittlesey, 1872a, 1873a, 1877a.
- Petrographic analysis: Thiessen, 1923, 1924.
- Pike Co.: Orton, 1874; Stout, 1916.
- Pittsburgh (No. 8) coal: Ashley, 1938a; Bownocker, 1908, 1926a; Brown, C.N., 1888; Burroughs, 1914b; Eavenson, 1938; Hoskins, 1941; Huston, 1883; Kosanke, 1943; Lovejoy, 1888; White, I. C., 1927.
- Pomeroy coal: Bownocker, 1908, 1908a; Hoskins, 1941; Kosanke, 1943; Lovejoy, 1888.
- Pottsville formation, coals of: Orton, 1884a.
- Portage Co.: Bownocker, 1917, 1929; Newberry, 1878a; Orton, 1884a; Whittlesey, 1869a, 1878.
- Production statistics: Keystone Coal Buyers Manual; Ohio Div. of Mines; U. S. Bur. of Mines.
- Pyrite in coal: Tucker, 1919.
- Quakertown (No. 2) coal: Roy, 1884a; Orton, 1884a; Ede, 1895.
- Redstone coal: See Pomeroy coal.

Coal: - continued

- Reserves: Ashley, 1938a; Averitt, 1950; Clark, F.R., 1917; Orton, 1896a; Ray, 1914, 1929.
- Scioto Co.: Bownocker, 1917, 1929; Briggs, 1838; Orton, 1878b, 1884a; Stout, 1916.
- Sharon (No. 1) coal: Haseltine, 1885; Howells, 1885; Orton, 1884a, f; Sturgeon, 1945.
- Southern Ohio: Andrews, 1865, 1871; Hunt, 1874, 1881.
- Spores: See Microfossils.
- Stark Co.: Bownocker, 1917, 1929; Claypole, 1895d; Newberry, 1878a, 1883b; Orton, 1884a, f; Whittlesey, 1869a, 1879b.
- Summerfield quadrangle: Condit, 1923.
- Summit Co.: Bownocker, 1917, 1929; Hildreth, 1837; Newberry, 1873a; Orton, 1884a, f; Whittlesey, 1869a.
- Trumbull Co.: Bownocker, 1929; Orton, 1884a; Read, 1873.
- Tuscarawas Co.: Bownocker, 1917, 1929; Briggs, 1838a; Hildreth, 1837; Newberry, 1878a; Orton, 1884a; Whittlesey, 1879b.
- Upper Freeport (No. 7) coal: Bownocker, 1908. flora: Abbott, 1950; Berry, 1933.
- Uses: Orton, 1883b.
- Vinton Co.: Bownocker, 1917, 1929; Orton, 1878b, 1884a; Watkins, 1890.
- Washington Co.: Andrews, 1864, 1874; Bell, G.L., 1950; Bownocker, 1917, 1929; Lesquereux, 1852; Smith, W.H., 1948, 1948a, 1949; White, G.W., 1947b.
- Wayne Co.: Bownocker, 1917, 1929; Comrey, 1921; Orton, 1884a, f; Read, 1878a.
- Waynesburg (No. 11) coal: White, G.W., 1947a.
- Wellston coal: See Quakertown (No. 2) coal.
- Woodsfield quadrangle: Condit, 1923.
- Coal measures: See Pennsylvanian; Permian.
- Coke manufacture: Newton, 1884.
- Columbiana Co.: See under General geology.
- Concretions: David, 1938; Greene, 1935; Napper, 1917; Rogers, M., 1935; Van Horn, 1933; Anonymous, 1945.
- Cone-in-cone: Eisele, 1944; Karhi, 1948, 1949; Newberry, 1885c.
- Conkle's Hollow: Ver Steeg, 1933.
- Correlations: See under Stratigraphy (general); also under the various geologic ages.
- Coshocton Co.: See under General geology.
- Crawford Co.: See under General geology.
- Cryptovolcanic structure: Bucher, 1921, 1925, 1928, 1933, 1935. magnetic survey: Sappenfield, 1950.
- Cuyahoga Co.: See under General geology.
- Darke Co.: See under General geology.
- Deep wells: See Pre-Cambrian; Cambrian. See also Sub-Trenton under Oil and gas.
- Defiance Co.: See under General geology.
- Delaware Co.: See under General geology.
- Devil's Tea Table, Morgan Co.: True, 1896.
- Devonian (Stratigraphic geology): See also under Paleobotany; Paleontology.
- Adams Co.: Lamborn, 1927, 1929; Locke, 1838.
- Ashtabula Co.: Chadwick, 1925; Hutton, 1940, 1941; Lesley, 1875; Orton, 1888d; Prosser, C.S., 1912a; Read, 1873; Rector, 1950.
- Ashtabula quadrangle: Hutton, 1940, 1941.
- Bedford shale: Girty, 1912.
- Bellefontaine outlier: Moses, 1922.
- Bellefontaine quadrangle: Swick, 1941, 1942.
- Black shales: Newberry, 1883a; Orton, 1882.
- Bone beds: Reutinger, 1941a; Wells, J.W., 1943a, 1944; Westgate, 1933.
- Brine-bearing strata: Stout, 1932.
- Camp Sherman quadrangle: Hyde, 1921.
- Chagrin formation: Chadwick, 1925; Van Horn, 1910a.
- Champaign Co.: Hill, 1878; Moses, 1922; White, G.W., 1926.
- Cherts, origin: Westgate, 1929.
- Clark Co.: Rogers, M., 1938, 1938a.
- Clays: Orton, 1893b.
- Cleveland region: Cushing, 1931; Williams, A.B., 1940.
- Cleveland shale: Cushing, 1912; Hicks, 1878; Prosser, C.S., 1913.
- Columbiana Co.: Stout, 1924.
- Columbus limestone, thickness: Griggs, 1904. unconformity at base: Kindle, 1913. underground mine: Stauffer, 1944.
- Columbus and Sandusky formations: Swartz, 1907.
- Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.
- Conneaut quadrangle: Hutton, 1940, 1941.
- Corniferous rocks: Bownocker, 1898.
- Correlations: Branson, 1911; Cooper, W.F., 1900; Decker, 1920; Hall, J., 1842, 1843, 1843a, 1848; Kindle, 1912, 1913; Lesley, 1875; Prosser, C.S., 1912a; Stauffer, 1907a; Swartz, 1907; Verwiebe, 1917a; Whitfield, 1880a; Whittlesey, 1851a; Williams, H.S., 1886, 1888, 1891; Winchell, N.H., 1876a.
- Crawford Co.: Briggs, 1838a; Stauffer, 1916b; Winchell, N.H., 1874.
- Crinoidal sands: Westgate, 1933.
- Cuyahoga Co.: Brainerd, 1853; Chadwick, 1925; Cushing, 1912, 1931; Lesley, 1875; Newberry, 1873a; Orton, 1886e, 1888d; Phalen, 1919; Prosser, C.S., 1912a; Rogers, G.S., 1917; Rothrock, 1949; Van Horn, 1917; Williams, A.B., 1940.
- Defiance Co.: Winchell, N.H., 1874, 1874a, b.
- Delaware Co.: Baker, R.C., 1942; Carman, 1927b;

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Delaware Co.: - continued

Hendrix, 1939, 1939a; Hicks, 1878; Hubbard, 1915; Prosser, C.S., 1905a; Stauffer, 1907, 1911, 1916b; Stewart, 1945a; Stout, 1940b; Wells, J.W., 1944; Westgate, 1926, 1933; White, G.W., 1926; Winchell, N.H., 1874, 1874a, b.

Delaware limestone: Prosser, C.S., 1905a, 1907. fauna: Westgate, 1933.

Detroit River limestone: Stumm, 1945.

Detroit River series: Stauffer, 1916.

Devonian-Mississippian contact: See under Mississippian.

Dolomites: Stout, 1941, 1944f.

East Liberty quadrangle: Swick, 1941, 1942.

Eastern Ohio: Ashley, 1938; Lockett, 1927; Russell, 1926.

Erie Co.: Branson, 1911; Hendrix, 1939, 1939a; Newberry, 1874b; Orton, 1888d; Prosser, C.S., 1905a; Stauffer, 1915, 1916b; Ver Steeg, 1932b.

Fairfield Co.: Bownocker, 1903a, 1910; Hyde, 1912.

Fayette Co.: Bernhagen, 1946; Hussey, 1878; Lamborn, 1927.

Franklin Co.: Foster, 1838; Harker, 1944; Hendrix, 1939, 1939a; Hubbard, 1915; Newberry, 1861; Orton, 1878a; Prosser, C.S., 1905a, 1910; Stauffer, 1907, 1911; Stewart, 1945a; Wells, J.W., 1944, 1947; Whitfield, 1880a.

Fulton Co.: Harker, 1945.

Gallia Co.: Stout, 1916.

Geauga Co.: Chadwick, 1925; Lesley, 1875; Prosser, C.S., 1912a.

General: Bownocker, 1903; Carney, 1911a; Claypole, 1903; Cooper, G.A., 1941; Hall, J., 1845; Harper, A.R., 1948; Lafferty, 1941; Leverett, 1902; Newberry, 1871, 1871c, 1872a, 1873, 1878; Ohio General Assembly, 1837; Orton, 1871b, 1882a, 1886, 1888, 1889, 1890, 1890e, 1893a; Stauffer, 1909; Stewart, 1938; Stout, 1945; White, C.A., 1862; Whitfield, 1882; Whittlesey, 1849a, 1869, 1869a.

Greene Co.: Rogers, M., 1938, 1938a.

Hamilton group: Stauffer, 1907.

Henry Co.: Winchell, N.H., 1874.

Highland Co.: Carman, 1929, 1930; Lamborn, 1927, 1929; Orton, 1871a; Rogers, J.K., 1936; Schillhahn, 1929.

Hillsboro sandstone: Carman, 1929, 1930; Prosser, C.S., 1916b; Schillhahn, 1929.

Hocking Co.: Bownocker, 1903a; Lesquereux, 1865.

Holmes Co.: Lamborn, 1949.

Huron Co.: Branson, 1911; Orton, 1888d; Read, 1878.

Huron shale: Prosser, C.S., 1913.

Devonian: - continued

Iron ore-bearing formations: Stout, 1945a.

Jackson Co.: Stout, 1916.

Kelley's Island: Carman, 1946; Fisher, 1922; Newberry, 1874b; Ver Steeg, 1935.

Knox Co.: Read, 1878.

Lake Co.: Chadwick, 1925; Lesley, 1875; Orton, 1888d; Prosser, C.S., 1912a; Read, 1873.

Lawrence Co.: Stout, 1916.

Licking Co.: Bownocker, 1903a.

Limestones: See also the names of specific limestone horizons.

Bownocker, 1915; Hawes, 1884; Lamborn, 1947; Orton, 1888f; Orton, Jr., 1906; Stauffer, 1906, 1907a, 1944; Stout, 1941; Winchell, N.H., 1874b.

Logan Co.: Hill, 1878; Moses, 1922; Swick, 1941, 1942; Wells, J.W., 1944; White, G.W., 1926.

London quadrangle: Rogers, M., 1938, 1938a.

Lorain Co.: Branson, 1911; Cushing, 1931; Hubbard, 1913; Newberry, 1874b; Orton, 1888d; Parker, 1950.

Lucas Co.: Carman, 1928, 1936; Gilbert, 1871, 1873; Stauffer, 1908; Stewart, 1927.

Madison Co.: Orton, 1878; Rogers, M., 1938, 1938a.

Marion Co.: Winchell, N.H., 1873.

Medina Co.: Cushing, 1931.

Mineral resources: Stout, 1932b.

Morrow Co.: Winchell, N.H., 1874.

Muskingum Co.: Cummins, 1931, 1931a; Stout, 1918.

Nomenclature: Grabau, 1915; Lesley, 1875; Williams, H.S., 1891.

Northeastern Ohio: Prosser, C.S., 1912a; Whittlesey, 1838a.

Northwestern Ohio: Rogers, W.B., 1842.

Ohio shale: Karhi, 1948, 1949; Orton, 1888d; Rogers, M., 1935; Ulrich, 1912.

fauna: Branson, 1911.

Olentangy shale: Grabau, 1915, 1917; Lamborn, 1927, 1929; Stauffer, 1907, 1915.

fauna: Baker, R.C., n.d., 1942; Hendrix, 1939, 1939a; Stauffer, 1916b, 1938, 1938a; Stewart, 1939.

Oriskany sand: Fettke, 1938.

Ottawa Co.: Kerr, J.E., 1950.

Paleoecology: Dachnowski, 1911; Wells, J.W., 1944, 1947.

Paulding Co.: Winchell, N.H., 1874, 1874a.

Perry Co.: Bownocker, 1910.

Pickaway Co.: Andrews, 1874; Hubbard, 1915; Lamborn, 1927.

Pike Co.: Bassler, 1911; Lamborn, 1927, 1929;

Melvin, 1933, 1934; Orton, 1874; Stout, 1916.

Piketon quadrangle: Melvin, 1933, 1934.

Plum Brook shale, fauna: Stumm, 1941, 1942.

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- Prout limestone: Grabau, 1917.
fauna: Stumm, 1941, 1942.
- Putnam Co.: Winchell, N.H., 1874.
- Ross Co.: Carman, 1947; Hyde, 1921; Lamborn, 1927, 1929; Melvin, 1933, 1934; Orton, 1874.
- Sandstones: Stout, 1944e.
- Sandusky Co.: Winchell, N.H., 1873.
- Scioto Co.: Lamborn, 1927; Stout, 1916.
- Sedimentary structures: Foerste, 1895; Prosser, C.S., 1916a.
- Seneca Co.: Winchell, N.H., 1873.
- Shales: See also the names of specific shale horizons.
Kindle, 1912; Lamborn, 1938; Newberry, 1883a; Orton, 1882; Verwiebe, 1917a.
- Silica shale, fauna: Stewart, 1927, 1930; Zuidema, 1946.
- Silurian-Devonian contact: Carman, 1927, 1927b, 1929, 1930, 1936; Schillhahn, 1929.
- South Charleston quadrangle: Rogers, M., 1938, 1938a.
- Southern Ohio: Andrews, 1865, 1871a; Briggs, 1838; Lamborn, 1927, 1929.
- Springfield quadrangle: Rogers, M., 1938, 1938a.
- Stratigraphic units, new: Cooper, G.A., 1941.
- Summit Co.: Cushing, 1931; Harker, 1944a; Newberry, 1873a; Phalen, 1919; Prosser, C.S., 1912a; Stauffer, 1944; White, I. C., 1918.
- Sylvania sandstone: Carman, 1936; Neff, 1890.
- Thickness estimate: Lamborn, 1934.
- Trumbull Co.: Prosser, C.S., 1912a; Read, 1873.
- Tuscarawas Co.: Cummins, 1947.
- Union Co.: Winchell, N.H., 1874.
- Vinton Co.: Lesquereux, 1865.
- Water-bearing horizons: Orton, 1899; Stout, 1944b.
- Wayne Co.: Bonine, 1915; Conrey, 1921; Phalen, 1919; Ver Steeg, 1940a.
- Wood Co.: Harker, 1945a; Winchell, N.H., 1874.
- Wyandot Co.: Winchell, N.H., 1873.
- Division of Geological Survey: See Ohio Geological Survey.
- Dolomites: Lee, 1947; Mihelcic, 1946; Prosser, C.S., 1910; Rogers, J.K., 1936; Stout, 1939, 1941, 1944f.
- Drainage changes: See also Glacial geology.
- Ashland Co.: Hubbard, 1908c; Todd, 1900; Ver Steeg, 1931a, 1934, 1936a; White, G.W., 1934c.
- Athens Co.: Stearns, 1899; Tight, 1900.
- Auglaize Co.: Bownocker, 1899.
- Belmont Co.: Eberle, 1936, 1937.
- Buried valleys, radio exploration for: Higgy, 1944.
- Butler Co.: Fememan, 1914, 1916.
- Cincinnati region: Desjardins, 1934; Fowke, 1900a.
- Clark Co.: Harker, 1943b.
- Columbiana Co.: Hance, 1925; Sturgeon, 1933, 1934.

Drainage changes: - continued

- Coshocton Co.: Clark, W.B., 1902; Tight, 1894; White, G.W., 1934c.
- Crawford Co.: White, G.W., 1934c.
- Cuyahoga Co.: Claypole, 1892d, f; Donner, 1941; Gould, 1887; Pierce, 1897; Upham, 1896, 1896a; Ver Steeg, 1934; Williams, A.B., 1940.
- Cuyahoga River: Whittlesey, 1885.
- Deep stage drainage: Stout, 1938b, 1944a.
- Delaware Co.: Stauffer, 1911.
- Fairfield Co.: Detmers, 1912; Hyde, 1904, 1912; Lamborn, 1932; Tight, 1897a.
- Franklin Co.: Harker, 1944; Nichols, 1910; Stauffer, 1911.
- Gallia Co.: Wilson, 1950.
- Geauga Co.: Scranton, 1932.
- General: Carney, 1911b; Coffey, 1914; Fowke, 1900; Leverett, 1932; Sharp, 1932.
- Greene Co.: Wells, W.E., 1904.
- Guernsey Co.: Mix, 1918.
- Hamilton Co.: Fememan, 1914, 1916; Wright, G.F., 1890a.
- Highland Co.: Tight, 1895.
- Hocking Co.: Merrill, W.M., 1950; Tight, 1897a.
- Holmes Co.: Hubbard, 1908c; Todd, 1900; Ver Steeg, 1934; White, G.W., 1934c, 1949.
- Jefferson Co.: Hance, 1925.
- Knox Co.: Clark, W.B., 1902; Lamborn, 1932; Todd, 1900; White, G.W., 1934c.
- Lake Co.: Scranton, 1932.
- Lake Erie basin: Claypole, 1882; Ireland, 1946; Spencer, 1881.
- Lawrence Co.: Campbell, 1900; Maxey, 1940, 1940a.
- Licking Co.: Carney, 1906, 1907, 1909; Clark, H., 1911; Clark, W.B., 1902; Davis, H.J., 1899; Detmers, 1912; Lamborn, 1932; Nixon, 1913; Prosser, C.S., 1910; Scheffel, 1909; Tight, 1894, 1894a, b.
- Little Miami River: Bownocker, 1900.
- Lorain Co.: Ver Steeg, 1934.
- Lowell col: Frye, 1938a.
- Lucas Co.: Carman, 1930a.
- Mahoning Co.: Foshay, 1890; Stephenson, 1933, 1934; Sturgeon, 1933, 1934.
- Medina Co.: Todd, 1900; Ver Steeg, 1934.
- Mercer Co.: Bownocker, 1899.
- Miami River: Fememan, 1912.
- Monroe Co.: Tight, 1900.
- Montgomery Co.: Norris, 1948, 1948a.
- Morgan Co.: Frye, 1937; Tight, 1900.
- Morrow Co.: White, G.W., 1934c.
- Muskingum Co.: Davis, H.J., 1899; Mix, 1918; Tight, 1894.
- Muskingum Valley, lower: Frye, 1937, 1940.
upper: Coffey, 1930.

Drainage changes: - continued

- Newark drainage system: Lamborn, 1932.
 Noble Co.: Frye, 1937; Tight, 1900.
 Northeastern Ohio: Chamberlin, T.C., 1894, 1894a; Coffey, 1930.
 Ohio River: Chamberlin, T.C., 1894, 1894a; Fowke, 1898, 1925, 1933; Ireland, 1946; James, J.F., 1888, 1891a; Leverett, 1897b, 1939b; Tight, 1898; Westgate, 1893; Wright, G.F., 1894a.
 Perry Co.: Davis, H.J., 1899; Detmers, 1912; Flint, N.K., 1948, 1949; Tight, 1897a.
 Pickaway Co.: Nichols, 1910.
 Pike Co.: Leverett, 1897a; Tight, 1895.
 Portage Co.: Scranton, 1932; Ver Steeg, 1934; Whittlesey, 1885.
 Post-Illinoian drainage: Stout, 1938b, 1944a.
 Radio exploration for buried valleys: Higgy, 1944.
 Richland Co.: Todd, 1900; White, G.W., 1934c.
 Rocky River: Dommer, 1941; Gould, 1887; Upham, 1896.
 Ross Co.: Campbell, 1918; Fowke, 1895; Tight, 1895.
 Scioto Co.: Baker, M.V., 1931, 1931a; Leverett, 1897a.
 Scioto valley, lower: Rich, 1935.
 Shelby Co.: Bownocker, 1899.
 Southeastern Ohio: Frye, 1938a; Happ, 1934; Perry, E.S., 1929; Stout, 1938b; Tight, 1900b; White, G.W., 1938.
 Southern Ohio: Stout, 1931b; Tight, 1897.
 Southwestern Ohio: Brand, 1932; Fenneman, 1914; Fowke, 1900a, 1901; James, J.F., 1893; Lesley, 1883; Leverett, 1891a; Miller, A.M., 1901; Tight, 1901; White, L.C., 1884; Wright, G.F., 1884c, 1890, 1894a.
 Stark Co.: Schaefer, E.J., 1946; Scranton, 1932; Ver Steeg, 1934.
 Summit Co.: Claypole, 1891a, 1892, 1892e, f; Harker, 1944a; Schaefer, E.J., 1946; Ver Steeg, 1934; Whittlesey, 1885.
 Teays drainage system: Fidler, 1943; Stout, 1938b, 1944, 1944a; Wolfe, 1942.
 Trumbull Co.: Foshay, 1890.
 Tuscarawas Co.: Ver Steeg, 1934.
 Warren Co.: Wolford, 1927.
 Washington Co.: Frye, 1937; Tight, 1900.
 Wayne Co.: Hubbard, 1908c; Todd, 1900; Ver Steeg, 1930; White, G.W., 1934c.
 Western Ohio: Ver Steeg, 1936, 1936b, 1938.
 Wood Co.: Carman, 1930a.
- Drainage systems: See Drainage changes; Geomorphology.
 Earthquakes: Rouse, 1938; Stechschulte, 1937; Westland, 1939, 1940.
 Economic geology: See also the names of specific mineral resources and products.
 Abandoned lake beds, economic value: Hubbard,

Economic geology: - continued

- Abandoned lake beds, economic value: - continued 1939a.
 Adams Co.: Locke, 1838.
 Allen Co.: Winchell, N.H., 1874.
 Ashland Co.: Read, 1878a.
 Ashtabula Co.: Hutton, 1940, 1941.
 Athens Co.: Andrews, 1873, 1878; Briggs, 1838, 1838a; Hildreth, 1838; Read, 1878b.
 Auglaize Co.: Winchell, N.H., 1874.
 Belmont Co.: Andrews, 1874; Atwater, 1819a; Condit, 1923; Mitchell, 1929; Schaefer, J.E., 1928; Stevenson, 1878.
 Butler Co.: Fenneman, 1916.
 Carroll Co.: Stevenson, 1878.
 Champaign Co.: Hill, 1878; Moses, 1922.
 Clark Co.: Orton, 1873; Rogers, M., 1938, 1938a.
 Cleveland district: Cushing, 1931; Williams, A.B., 1940.
 Columbiana Co.: Hance, 1925; Newberry, 1878a; Stout, 1924.
 Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.
 Conemaugh formation: Condit, 1909, 1912a.
 Coshocton Co.: Hodge, 1878.
 Crawford Co.: Briggs, 1838a; Winchell, N.H., 1874.
 Cuyahoga Co.: Cushing, 1931; Newberry, 1873a; Williams, A.B., 1940.
 Darke Co.: Lindenmuth, 1878.
 Defiance Co.: Winchell, N.H., 1874.
 Delaware Co.: Hubbard, 1915; Stauffer, 1911; Westgate, 1926; Winchell, N.H., 1874.
 Dunkard series: Stauffer, 1920.
 Erie Co.: Newberry, 1874b.
 Fairfield Co.: Andrews, 1874; Hildreth, 1834; Reutinger, 1941, 1942.
 Franklin Co.: Hubbard, 1915; Orton, 1878a; Prosser, C.S., 1910; Stauffer, 1911.
 Fulton Co.: Gilbert, 1873.
 Gallia Co.: Andrews, 1873; Briggs, 1838; McMillin, 1881; Stout, 1916; Wilson, 1950.
 Geauga Co.: Read, 1871, 1873.
 General: Atwater, 1838; Bownocker, 1911b; Carney, 1910b; Everhart, 1949; Fenneman, 1927; Grimsley, 1933; Haseltine, 1888; Mather, W.W., 1838, 1838b; Newberry, 1871; Ohio Chamber of Commerce, 1949; Ohio Devel. & Publ. Comm., 1944; Orton, 1871b; Peattie, 1923; Schrader, 1917; Stout, 1932b, 1938; White, G.W., 1944, 1947; Whittlesey, 1849a, 1858.
 Greene Co.: Orton, 1874; Rogers, M., 1938, 1938a.
 Guernsey Co.: Andrews, 1874; Condit, 1923; Mix, 1918; Nesbitt, 1930, 1930a; Schaefer, J.E., 1928; Stevenson, 1878.

Economic geology: - continued

- Hamilton Co.: Fenneman, 1916.
 Hancock Co.: Shaffer, 1937, 1937a; Winchell, N.H., 1874.
 Hardin Co.: Winchell, N.H., 1874.
 Harrison Co.: Stevenson, 1878.
 Highland Co.: Orton, 1871a; Rogers, J.K., 1936.
 Hocking Co.: Andrews, 1878; Briggs, 1838, 1838a; Hohler, 1950; Merrill, W. M., 1948, 1949, 1950; Orton, 1878b; Read, 1878b.
 Hocking Valley region: Hunt, 1881; Jennings, 1888.
 Holmes Co.: Read, 1871, 1878a; White, G.W., 1949.
 Islands, Lake Erie: Newberry, 1874b.
 Jackson Co.: Briggs, 1838; McClure, R.I., 1939; Orton, 1878b; Roy, 1883; Stout, 1916.
 Jefferson Co.: Hance, 1925; Lamborn, 1930; Newberry, 1878b.
 Kelley's Island: Fisher, 1922; Newberry, 1874b; Ver Steeg, 1935.
 Knox Co.: Read, 1878.
 Lawrence Co.: Briggs, 1838; McMillin, 1881; Orton, 1878b; Maxey, 1940, 1940a; Phalen, 1908, 1912; Stout, 1916.
 Licking Co.: Hildreth, 1834; Read, 1878; Reutinger, 1941, 1942.
 Logan Co.: Hill, 1878; Moses, 1922; Swick, 1941, 1942.
 Lorain Co.: Cushing, 1931; Newberry, 1874b.
 Lucas Co.: Gilbert, 1871, 1873.
 Madison Co.: Rogers, M., 1938, 1938a.
 Mahoning Co.: Newberry 1878b; Stephenson, 1933, 1934.
 Marion Co.: Winchell, N.H., 1873.
 Medina Co.: Cushing, 1931; Harker, 1943; Wheat, 1878.
 Meigs Co.: Andrews, 1873; Hildreth, 1838; Stout, 1940c.
 Mercer Co.: Winchell, N.H., 1874.
 Mineral industries, directory: Bownocker, 1928, maps: Bownocker, 1928; White, G.W., 1947d, production statistics: Ohio Div. Mines; U. S. Bur. Mines.
 rank of Ohio in 1945: White, G.W., 1947.
 Mississippian system: Newberry, 1874a.
 Monongahela formation: Stout, 1930.
 Monroe Co.: Andrews, 1874; Arkle, 1950, 1951; Condit, 1923.
 Montgomery Co.: Orton, 1871.
 Morgan Co.: Andrews, 1873; Bartlett, 1950, 1951; Frye, 1937; Hildreth, 1834, 1838.
 Morrow Co.: Winchell, N.H., 1874.
 Muskingum Co.: Andrews, 1873; Foster, 1838; Hildreth, 1834, 1838; Mix, 1918; Reutinger, 1941, 1942; Stevenson, 1878; Stout, 1918.

Economic geology: - continued

- Noble Co.: Andrews, 1874; Condit, 1923; Frye, 1937.
 Northeastern Ohio: Newberry, 1857; Whittlesey, 1838a.
 Ottawa Co.: Winchell, N.H., 1874.
 Paulding Co.: Winchell, N.H., 1874.
 Pennsylvanian system: Newberry, 1874a.
 Perry Co.: Andrews, 1878; Bowen, 1947, 1948; Flint, N.K., 1946, 1947, 1948, 1949; Hildreth, 1834, 1838; Read, 1878b; Reutinger, 1941, 1942.
 Pickaway Co.: Andrews, 1874; Hildreth, 1834.
 Pike Co.: Melvin, 1933, 1934; Orton, 1874; Stout, 1916.
 Portage Co.: Newberry, 1878a.
 Preble Co.: Orton, 1878.
 Production statistics: Ohio Div. Mines; U. S. Bur. Mines.
 Putnam Co.: Winchell, N.H., 1874.
 Richland Co.: Read, 1878.
 Ross Co.: Hildreth, 1834; Melvin, 1933, 1934; Orton, 1874.
 Sandusky Co.: Winchell, N.H., 1873.
 Scioto Co.: Baker, M.V., 1931, 1931a; Briggs, 1838; Orton, 1878b; Stout, 1916.
 Seneca Co.: Shaffer, 1937, 1937a; Winchell, N.H., 1873.
 Southeastern Ohio: Andrews, 1871, 1871a, b; Hildreth, 1836; Jones, J.W., 1897.
 Southern Ohio: Andrews, 1865.
 Stark Co.: Bognar, 1926; Newberry, 1878a.
 Summerfield quadrangle: Condit, 1923.
 Summit Co.: Cushing, 1931; Hildreth, 1837; Newberry, 1873a.
 Trumbull Co.: Read, 1873.
 Tuscarawas Co.: Briggs, 1838a; Newberry, 1878a.
 Union Co.: Winchell, N.H., 1874.
 Van Wert Co.: Winchell, N.H., 1874.
 Vinton Co.: Orton, 1878b; Stout, 1927.
 Washington Co.: Andrews, 1874; Bell, G.L., 1950; Frye, 1937; Hildreth, 1826, 1834, 1838; Smith, W.H., 1948, 1948a, 1949.
 Wayne Co.: Conrey, 1921; Read, 1878a.
 West Sister Island: Gilbert, 1873.
 Williams Co.: Gilbert, 1873.
 Wood Co.: Briggs, 1838a; Shaffer, 1937, 1937a; Winchell, N.H., 1874.
 Woodsfield quadrangle: Condit, 1923.
 Engineering geology:
 Highway construction: Marshall, 1950.
 Erie Co.: See under General geology.
 Erosion: See Beach erosion under Geomorphology; Mass movement under Geomorphology; Soil erosion under Soils.

- Erosion surfaces: See under Geomorphology.
- Fairfield Co.: See under General geology.
- Fayette Co.: See under General geology.
- Field geology at Ohio State University: Lamb, 1905; Mead, 1903.
- Field trips, central Ohio: Prosser, C.S., 1910.
- Flint: Morgan, 1929; Stout, 1945; Turkopp, 1915.
- Flint Ridge: Conrad, 1841; Morgan, 1929; Turkopp, 1915.
- Floods in Muskingum valley, relation of geologic and physiographic history: Ireland, 1941.
- Franklin Co.: See under General geology.
- Friend well, Clark Co.: Wasson, 1932.
- Fuel resources: Melvin, 1948.
- Fuels, synthetic: Kerr, T.H., 1948.
- Fulton Co.: See under General geology.
- Gallia Co.: See under General geology.
- Ganister: Henderson, H.B., 1916.
- Gas: See Oil and gas.
- Geauga Co.: See under General geology.
- General geology: See also Economic geology; Geomorphology; Glacial geology; Paleontology; Stratigraphy; Structure; and the various geologic ages.
- Atwater, 1826, 1838; Carney, 1911a; Christy, 1848; Cooper, W.F., 1895; Gilbert, 1893; Grimsley, 1933; Harper, A.R., 1948; Lyell, 1845; Mather, 1838a; Newberry, 1868b, 1871, 1871c, 1872a, 1873, 1874c, 1878; Orton, 1871b, 1888, 1890, 1890e, 1893a, e; Riddell, 1836; Whittlesey, 1847, 1849a, 1858.
- Adams Co.: Andrews, 1891; Locke, 1838.
- Allen Co.: Winchell, N.H., 1874.
- Ashland Co.: Read, 1878a.
- Ashtabula Co.: Hutton, 1940, 1941; Read, 1873; Whittlesey, 1869a.
- Ashtabula quadrangle: Hutton, 1940, 1941.
- Athens Co.: Andrews, 1873, 1878; Briggs, 1838, 1838a.
- Auglaize Co.: Winchell, N.H., 1874.
- Barnesville region: Schaefer, J.E., 1928.
- Bass Islands: Mohr, 1931, 1931a; Newberry, 1874b.
- Belmont Co.: Andrews, 1874; Atwater, 1819a; Eberle, 1936, 1937; Mitchell, 1929; Schaefer, J.E., 1928; Stevenson, 1878.
- Brown Co.: Atkins, 1940; Herzer, 1878.
- Butler Co.: Fenneman, 1916; Locke, 1838; Orton, 1878.
- Camp Sherman quadrangle: Hyde, 1921.
- Carroll Co.: Stevenson, 1878.
- Central Ohio: Ohio General Assembly, 1837.
- Champaign Co.: Hill, 1878; Ohio General Assembly, 1837.
- Cincinnati region: Drake, 1825; Fenneman, 1916; James, J. F., 1886a; Nickles, 1902; Ohio General Assembly, 1837; Owen, D.D., 1846.
- Clark Co.: Ohio General Assembly, 1837; Orton, 1873.
- General geology: - continued
- Clermont Co.: Orton, 1873.
- Cleveland region: Bacon, 1950; Cushing, 1931; Williams, A.B., 1940.
- Clinton Co.: Hussey, 1878; Ohio General Assembly, 1837.
- Columbiana Co.: Hance, 1925; Newberry, 1878a; Stout, 1924; Whittlesey, 1879b.
- Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.
- Conneaut quadrangle: Hutton, 1940, 1941.
- Coschocton Co.: Hildreth, 1837; Hodge, 1878; Meyers, T.R., 1929, 1929a; Ohio General Assembly, 1837.
- Crawford Co.: Briggs, 1838a; Ohio General Assembly, 1837; Winchell, N.H., 1874.
- Cuyahoga Co.: Bacon, 1950; Beach Erosion Bd., 1950; Cushing, 1931; Newberry, 1873a; Whittlesey, 1869a; Williams, A.B., 1940.
- Darke Co.: Lindenmuth, 1878.
- Defiance Co.: Winchell, N.H., 1874.
- Delaware Co.: Hubbard, 1915; Stauffer, 1911; Westgate, 1926; Winchell, N.H., 1874.
- Eastern Ohio: Whittlesey, 1869.
- Erie Co.: Beach Erosion Bd., 1942; Mosely, 1895; Newberry, 1874b.
- Fairfield Co.: Andrews, 1874; Hildreth, 1834; Hyde, 1912.
- Fayette Co.: Hussey, 1878.
- Fire lands: Niles, J.H., 1866.
- Franklin Co.: Foster, 1838; Hubbard, 1915; Orton, 1878a; Prosser, C.S., 1910; Stauffer, 1911.
- Fulton Co.: Gilbert, 1871, 1873.
- Gallia Co.: Andrews, 1873; Briggs, 1838; Stout, 1916; Wilson, 1950.
- Geauga Co.: Read, 1871, 1873; Whittlesey, 1869a.
- Greene Co.: Ohio General Assembly, 1837; Orton, 1874.
- Guernsey Co.: Andrews, 1874; Mix, 1918; Nesbitt, 1930, 1930a; Schaefer, J.E., 1928; Stevenson, 1878.
- Hamilton Co.: Bell, T.J., 1882; Fenneman, 1916; James, J. F., 1886a; Locke, 1838; Nickles, 1902; Orton, 1873.
- Hancock Co.: Ohio General Assembly, 1837; Winchell, N.H., 1874.
- Hardin Co.: Ohio General Assembly, 1837; Winchell, N.H., 1874.
- Harrison Co.: Stevenson, 1878.
- Henry Co.: Winchell, N.H., 1874.
- Highland Co.: Ohio General Assembly, 1837; Orton, 1871a; Rogers, J.K., 1933, 1936.
- Hocking Co.: Andrews, 1878; Briggs, 1838, 1838a; Hohler, 1950; Merrill W.M., 1948, 1949, 1950.
- Hocking Valley region: Jemmings, 1888.
- Holmes Co.: Ohio General Assembly, 1837; Read, 1871, 1878a; White, G.W., 1949.

General geology: - continued

- Huntington quadrangle: Campbell, 1900.
 Huron Co.: Ohio General Assembly, 1837; Read, 1878.
 Islands, Lake Erie: Carman, 1946; Fisher, 1922; Gilbert, 1873; Mohr, 1931, 1931a; Newberry, 1874b; Ver Steeg, 1935.
 Jackson Co.: Briggs, 1838; Stout, 1916.
 Jefferson Co.: Griswold, 1907; Hance, 1925; Lamborn, 1930; Newberry, 1878b.
 Kelley's Island: Fisher, 1922; Newberry, 1874b; Ver Steeg, 1935.
 Kenova quadrangle: Phalen, 1912.
 Knox Co.: Read, 1878.
 Lake Co.: Beach Erosion Bd., 1950a; Read, 1873; Whittlesey, 1869a.
 Lake Erie shore: Stout, 1933.
 Lawrence Co.: Briggs, 1838; Campbell, 1900; Maxey, 1940, 1940a; Phalen, 1912; Stout, 1916.
 Licking Co.: Carney, 1906; Foster, 1838; Herrick, 1887; Hildreth, 1828, 1834, 1837; Read, 1878.
 Logan Co.: Hill, 1878; Ohio General Assembly, 1837.
 Lorain Co.: Cushing, 1931; Newberry, 1874b; Whittlesey, 1869a.
 Lucas Co.: Beach Erosion Bd., 1945; Carman, 1928; Gilbert, 1871, 1873; Ohio General Assembly, 1837.
 Madison Co.: Orton, 1878.
 Mahoning Co.: Hildreth, 1837; Newberry, 1878b; Stephenson, 1933, 1934; Whittlesey, 1838a.
 Marion Co.: Winchell, N.H., 1873.
 Medina Co.: Cushing, 1931; Ohio General Assembly, 1837; Wheat, 1878.
 Meigs Co.: Andrews, 1873; Stout, 1940c.
 Mercer Co.: Winchell, N.H., 1874.
 Miami Co.: Hussey, 1878; Locke, 1838.
 Monroe Co.: Andrews, 1874; Arkle, 1950, 1950a, 1951.
 Montgomery Co.: Locke, 1838; Orton, 1871.
 Morgan Co.: Andrews, 1873; Bartlett, 1950, 1951; Frye, 1937; Hildreth, 1828, 1834.
 Morrow Co.: Winchell, N.H., 1874.
 Muskingum Co.: Andrews, 1873; Foster, 1838; Hildreth, 1828, 1834; Mix, 1918; Ohio General Assembly, 1837; Stevenson, 1878; Stout, 1918.
 Muskingum Valley: Hildreth, 1836.
 Noble Co.: Andrews, 1874; Frye, 1937.
 Northeastern Ohio: Newberry, 1857; Whittlesey, 1838a.
 Northern Ohio: Niles, 1866.
 Ohio Valley: Drake, 1825; Hildreth, 1836; Owen, D.D., 1846.
 Ottawa Co.: Beach Erosion Bd., 1945; Winchell, N.H., 1874.
 Paulding Co.: Winchell, N.H., 1874.

General geology: - continued

- Perry Co.: Andrews, 1878; Bowen, 1947, 1948; Flint, 1946, 1947, 1948, 1949; Hildreth, 1834.
 Pickaway Co.: Andrews, 1874; Hildreth, 1834; Hubbard, 1915.
 Pike Co.: Melvin, 1933, 1934; Orton, 1874; Stout, 1916.
 Piketon quadrangle: Melvin, 1933, 1934.
 Portage Co.: Hildreth, 1837; Newberry, 1878a; Whittlesey, 1838a, 1878.
 Preble Co.: Locke, 1838; Orton, 1878.
 Putnam Co.: Winchell, N.H., 1874.
 Richland Co.: Ohio General Assembly, 1837; Read, 1878.
 Ross Co.: Hildreth, 1834; Hyde, 1921; Melvin, 1933, 1934; Orton, 1874.
 Sandusky area: Mosely, 1895.
 Sandusky Co.: Ohio General Assembly, 1837; Winchell, N.H., 1873.
 Scioto Co.: Andrews, 1891; Baker, M.V., 1931, 1931a; Briggs, 1838; Stout, 1916.
 Seneca Co.: Ohio General Assembly, 1837; Winchell, N.H., 1873.
 Shelby Co.: Hussey, 1878.
 Southeastern Ohio: Andrews, 1871a, b; Hildreth, 1836.
 Stark Co.: Bognar, 1926; Hildreth, 1837; Newberry, 1878a; Whittlesey, 1879b.
 Steubenville quadrangle: Griswold, 1907.
 Summit Co.: Cushing, 1931; Hildreth, 1837; Newberry, 1873a.
 Trumbull Co.: Hildreth, 1837; Read, 1873; Whittlesey, 1838a.
 Tuscarawas Co.: Briggs, 1838a; Hildreth, 1837; Newberry, 1878a; Whittlesey, 1879b.
 Union Co.: Winchell, N.H., 1874.
 Van Wert Co.: Winchell, N.H., 1874.
 Vinton Co.: Stout, 1927.
 Warren Co.: Orton, 1878; Wolford, 1927.
 Washington Co.: Andrews, 1874; Bell, G.L., 1950; Frye, 1937; Hildreth, 1826, 1828, 1834; Smith, W.H., 1948, 1948a, 1949.
 Wayne Co.: Conrey, 1921; Ohio General Assembly, 1837; Read, 1878a.
 Wellsville quadrangle: Hance, 1925.
 West Sister Island: Gilbert, 1873.
 Williams Co.: Gilbert, 1871, 1873.
 Wood Co.: Briggs, 1838a; Ohio General Assembly, 1837; Winchell, N.H., 1874.
 Wyandot Co.: Winchell, N.H., 1873.
 Youngstown region: Stephenson, 1933, 1934.
 Generalized section of the rocks of Ohio: Stout, 1947.
 Geologic formations: See Stratigraphy (general);
 Geologic maps; also the names of formations under the various geologic ages.

- Geologic map index of Ohio: Boardman, 1949.
- Geologic maps: Bownocker, 1920a; Hall, J., 1843; Leverett, 1897; Logan, 1869; Lyell, 1845; Marcou, 1853; Newberry, 1868b, 1870a, 1871, 1879; Ohio Geol. Survey, 1909; Orton, 1888i, 1893a; Sayler, 1865; Whittlesey, 1856.
- Ohio and Indiana: Eckel, 1913; Leverett, 1905. corrections to map of 1879: Andrews, 1879a.
- Ashland Co.: Read, 1878a.
- Ashtabula Co.: Read, 1873.
- Belmont Co., Barnesville region: Schaefer, J.E., 1928. Flushing and Wheeling townships: Eberle, 1936.
- Bibliography: Boardman, 1949.
- Butler Co.: Orton, 1878.
- Camp Sherman quadrangle: Hyde, 1921.
- Champaign Co.: Hill, 1878. Bellefontaine outlier: Moses, 1922.
- Clark Co.: Orton, 1873.
- Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.
- Coshocton Co.: Hodge, 1878; Lamborn, 1948. Bedford and Jefferson townships: Meyers, T.R., 1929.
- Crawford Co.: Winchell, N.H., 1874.
- Cuyahoga Co.: Newberry, 1873a.
- Defiance Co.: Winchell, N.H., 1874.
- Delaware Co.: Westgate, 1926; Winchell, N.H., 1874. Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.
- Eastern Ohio: Whittlesey, 1869.
- Erie Co.: Newberry, 1874b.
- Franklin Co.: Orton, 1878a. Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.
- Gallia Co., Addison and Springfield townships: Wilson, 1950.
- Geauga Co.: Read, 1873.
- Greene Co.: Norris, 1950; Orton, 1874.
- Guernsey Co.: Nesbitt, 1930. Barnesville region: Schaefer, J.E., 1928.
- Hancock Co.: Winchell, N.H., 1874.
- Hardin Co.: Winchell, N.H., 1874.
- Henry Co.: Winchell, N.H., 1874.
- Highland Co.: Orton, 1871a; Rogers, J.K., 1936.
- Hocking Co., Green and Ward townships: Merrill, W.M., 1948. northern part: Merrill, 1950. Perry Township: Hohler, 1950.
- Holmes Co.: Read, 1878a; White, G.W., 1947c, 1949.
- Huron Co.: Read, 1878.
- Index to: Boardman, 1949.
- Islands, Lake Erie: Newberry, 1874b.
- Jefferson Co.: Lamborn, 1930.
- Knox Co.: Read, 1878.
- Geologic maps: - continued
- Lake Co.: Read, 1873.
- Lawrence Co., in part: Maxey, 1940.
- Licking Co.: Read, 1878. Flint Ridge: Turkopp, 1915.
- Logan Co.: Hill, 1878. Bellefontaine outlier: Moses, 1922.
- Lucas Co.: Gilbert, 1873.
- Marion Co.: Winchell, N.H., 1873.
- Medina Co.: Wheat, 1878.
- Monroe Co., Switzerland Township: Arkle, 1950.
- Montgomery Co.: Orton, 1871.
- Morgan Co., Union Township: Bartlett, 1950.
- Morrow Co.: Winchell, N.H., 1874.
- Muskingum Co., Flint Ridge: Turkopp, 1915.
- Ohio Valley: Owen, D.D., 1846.
- Ottawa Co.: Winchell, N.H., 1874.
- Paulding Co.: Winchell, N.H., 1874.
- Perry Co.: Flint, N.K., 1948, 1948a. Clayton and Pike townships: Bowen, 1947. Monday Creek and Salt Lick townships: Flint, N.K., 1946.
- Pickaway Co., Columbus quadrangle: Hubbard, 1915.
- Pike Co.: Orton, 1874. Piketon quadrangle: Melvin, 1933.
- Portage Co.: Newberry, 1878a.
- Preble Co.: Orton, 1878.
- Putnam Co.: Winchell, N.H., 1874.
- Richland Co.: Read, 1878.
- Ross Co.: Orton, 1874. Camp Sherman quadrangle: Hyde, 1921. Piketon quadrangle: Melvin, 1933.
- Sandusky Co.: Winchell, N.H., 1873.
- Scioto Co., Harrison and Bloom townships: Baker, M.V., 1931.
- Seneca Co.: Winchell, N.H., 1873.
- Southern Ohio: Andrews, 1865.
- Southwestern Ohio: Fuller, M.L., 1912; Orton, 1873.
- Summit Co.: Newberry, 1873a.
- Trumbull Co.: Read, 1873.
- Tuscarawas Co.: Cummins, 1947.
- Union Co.: Winchell, N.H., 1874.
- Van Wert Co.: Winchell, N.H., 1874.
- Warren Co.: Orton, 1878. Oregonia-Ft. Ancient region: Wolford, 1927.
- Washington Co., Lower Muskingum Valley: Frye, 1937. Newport Township: Smith, W.H., 1948, 1948a. Salem Township: Bell, G.L., 1950.
- Wayne Co.: Conrey, 1921; Read, 1878a.
- Wood Co.: Winchell, N.H., 1874.
- Wyandot Co.: Winchell, N.H., 1873.
- Geological Survey of Ohio: See Ohio Geological Survey.
- Geology, influence on Ohio place names: Cottingham, 1949.

Geomorphology: See also Drainage changes; Glacial geology; Scenic features.

- Adams Co.: Andrews, 1891; Locke, 1838.
 Allen Co.: Winchell, N.H., 1874.
 Ashland Co.: Read, 1878a; Ver Steeg, 1936a.
 Ashtabula Co.: Hutton, 1940, 1941; Read, 1873.
 Athens Co.: Andrews, 1873; Briggs, 1838a;
 Condit, 1912a; Stauffer, 1920.
 Auglaize Co.: Winchell, N.H., 1874.
 Bass Islands: Mohr, 1931, 1931a; Newberry, 1874b.
 Beach erosion: Adams, 1949; Mather, W.W., 1838;
 Weichel, 1946; White, G.W., 1944a, 1945;
 Whittlesey, 1866.
 Cuyahoga Co.: Beach Erosion Bd., 1950.
 Erie Co.: Beach Erosion Bd., 1942.
 Lake Co.: Beach Erosion Bd., 1950a.
 Lucas Co.: Beach Erosion Bd., 1945.
 Ottawa Co.: Beach Erosion Bd., 1945.
 Belmont Co.: Andrews, 1874; Atwater, 1819a;
 Condit, 1912a, 1923; Mitchell, 1929;
 Schaefer, J.E., 1928; Stauffer, 1920;
 Ver Steeg, 1944a.
 Black River valley: Hubbard, 1925.
 Butler Co.: Bernhagen, 1947a; Fenneman, 1916;
 Orton, 1878.
 Camp Sherman quadrangle: Campbell, 1918;
 Hyde, 1921.
 Carroll Co.: Condit, 1912a; Stevenson, 1878;
 Ver Steeg, 1944a.
 Caves and caverns: Andrews, 1876; Carman, 1946;
 Cottingham, 1919; Fuller, M.L., 1904; Hills,
 1916; James, J. F., 1890a; Kraus, 1905a, b;
 Mohr, 1931, 1931a; Morgan, 1929; Ver-
 Steeg, 1933; White, G.W., 1925, 1926.
 Cedar Point, formation of: Mosely, 1905.
 Central Ohio: Sharp, 1932.
 Champaign Co.: Hill, 1878; Moses, 1922.
 Clark Co.: Davis, W.M., 1884; Harker, 1943b;
 Orton, 1873.
 Clermont Co.: Orton, 1873.
 Clinton Co.: Austin, 1930; Hussey, 1878.
 Columbiana Co.: Condit, 1912a; Newberry, 1878a;
 Stout, 1924; Ver Steeg, 1944a.
 Columbus quadrangle: Hubbard, 1915; Stauffer,
 1911.
 Coshocton Co.: Hodge, 1878; Meyers, T.R.,
 1929, 1929a.
 Crawford Co.: Briggs, 1838a; Hubbard, 1925;
 Winchell, N.H., 1874.
 Cuyahoga Co.: Davis, W.M., 1884; Cushing, 1931;
 Donner, 1941; Hubbard, 1925; Newberry,
 1873a; Williams, A.B., 1940.
 Cuyahoga River valley: Donner, 1941.
 Darke Co.: Lindenmuth, 1878.
 Defiance Co.: Winchell, N.H., 1874.
 Delaware Co.: Hubbard, 1915; Stauffer, 1911;

Geomorphology: - continued

- Delaware Co.: - continued
 Westgate, 1926; Winchell, N.H., 1874.
 Erie Co.: Hubbard, 1925; Mosely, 1905; Newberry,
 1874b; Ver Steeg, 1932b; Westgate, 1904.
 Erosion: See Beach erosion; Mass movement; See also
 Soil erosion under Soils.
 Erosion surfaces: Campbell, 1903; Cole, W.S., 1934,
 1935, 1937, 1941; Hubbard, 1909; Sharp, 1932;
 Stout, 1938b; Ver Steeg, 1931, 1939, 1940.
 Tertiary erosion surface: See Drainage changes;
 Glacial geology.
 Fairfield Co.: Andrews, 1874; Hildreth, 1834;
 Hyde, 1912.
 Fayette Co.: Bernhagen, 1946; Hussey, 1878.
 Franklin Co.: Foster, 1838; Hubbard, 1909, 1915;
 Orton, 1878a; Stauffer, 1911.
 Fulton Co.: Gilbert, 1871, 1873; Harker, 1945.
 Gallia Co.: Condit, 1912a; Stout, 1916; Whittlesey,
 1838; Wilson, 1950.
 Geauga Co.: Read, 1871, 1873.
 General: Atwater, 1838; Carney, 1911b; Harper,
 A.R., 1948; Leverett, 1897, 1902; Newberry,
 1878; Orton, 1890e; Peattie, 1923; Smith,
 G.H., 1935; Stout, 1944; Tight, 1900a;
 U.S.G.S., 1922.
 Gorges: Carman, 1946; Davis, W.M., 1884; Mather,
 K.F., 1909; Scheffel, 1907; Wells, W.E., 1904.
 Greene Co.: Carman, 1946; Orton, 1874; Wells,
 W.E., 1904.
 Guernsey Co.: Condit, 1912a, 1923; Mix, 1918;
 Nesbitt, 1930, 1930a; Schaefer, J.E., 1928;
 Ver Steeg, 1944a.
 Hamilton Co.: Bernhagen, 1947a; Burke, M.D.,
 1888; Fenneman, 1916; James, J.F., 1886a;
 Nickles, 1902; Orton, 1873.
 Hancock Co.: Winchell, N.H., 1874.
 Hardin Co.: Winchell, N.H., 1874.
 Harrison Co.: Condit, 1912a.
 Henry Co.: Winchell, N.H., 1874.
 Highland Co.: Rogers, J.K., 1936.
 Hocking Co.: Andrews, 1876; Briggs, 1838a;
 Carman, 1946; Hohler, 1950; Merrill, W.M.,
 1948, 1949, 1950; Ver Steeg, 1933;
 Whittlesey, 1838.
 Holmes Co.: Read, 1871, 1878a; White, G.W., 1949.
 Huron Co.: Hubbard, 1925; Read, 1878.
 Huron River valley: Hubbard, 1925.
 Islands, Lake Erie: Carman, 1946; Cook, 1926;
 Mohr, 1931, 1931a.
 Jackson Co.: Stout, 1916; Whittlesey, 1838.
 Jefferson Co.: Condit, 1912a; Lamborn, 1930;
 Newberry, 1878b; Stauffer, 1920; Ver Steeg,
 1944a.
 Kelley's Island: Fisher, 1922; Newberry, 1874b;
 Ver Steeg, 1935.

Geomorphology: - continued

- Knox Co.: Read, 1878.
 Lake Co.: Read, 1873.
 Landslides: Hubbard, 1908b; Mitchell, 1941;
 Rogers, J.K., 1928; Van Horn, 1909, 1910;
 Von Schlichten, 1935.
 Lawrence Co.: Campbell, 1900; Condit, 1912a;
 Lesley, 1858; Maxey, 1940, 1940a; Phalen,
 1912; Stout, 1916; Whittlesey, 1838.
 Licking Co.: Carney, 1906, 1909; Foster, 1838;
 Herrick, 1887; Hildreth, 1828, 1834, 1837;
 Read, 1878.
 Logan Co.: Hill, 1878; Moses, 1922.
 Lorain Co.: Cushing, 1931; Hubbard, 1925;
 Newberry, 1874b; Wright, G.F., 1908.
 Lucas Co.: Gilbert, 1871, 1873; Westgate, 1904.
 Madison Co.: Orton, 1878.
 Mahoning Co.: Hildreth, 1837; Newberry, 1878b;
 Stephenson, 1933, 1934.
 Marion Co.: Winchell, N.H., 1873.
 Mass movement: Mitchell, 1940; Napper, 1914;
 Savage, 1950; Sharpe, 1941.
 Maumee River valley: Flynn, 1904; Gilbert,
 1871a, c; Klippart, 1871.
 Medina Co.: Cushing, 1931; Harker, 1943;
 Hubbard, 1925; Wheat, 1878.
 Meigs Co.: Condit, 1912a; Stauffer, 1920.
 Mercer Co.: Winchell, N.H., 1874.
 Miami Co.: Hussey, 1878.
 Miami River valley: Flynn, 1904.
 Monroe Co.: Andrews, 1874; Arkle, 1950, 1951;
 Condit, 1923; Stauffer, 1920; Ver Steeg, 1944a.
 Montgomery Co.: Norris, 1948; Orton, 1871.
 Morgan Co.: Bartlett, 1950, 1951; Condit, 1912a;
 Frye, 1937; Hildreth, 1828, 1834; True,
 1896; Stauffer, 1920.
 Morrow Co.: Winchell, N.H., 1874.
 Muskingum Co.: Condit, 1912a; Foster, 1838;
 Hildreth, 1828, 1834; Mix, 1918; Stevenson,
 1878; Stout, 1918.
 Muskingum River valley: Flynn, 1904.
 Noble Co.: Andrews, 1874; Condit, 1912a, 1923;
 Frye, 1937; Stauffer, 1920.
 Northeastern Ohio: Prosser, C.S., 1912a; Whittlesey,
 1838a.
 Ottawa Co.: Conrey, 1929; Mosely, 1905; West-
 gate, 1904; Winchell, N.H., 1874.
 Paulding Co.: Winchell, N.H., 1874.
 Perry Co.: Condit, 1912a; Flint, N.K., 1948, 1949;
 Hildreth, 1834.
 Pickaway Co.: Andrews, 1874; Hildreth, 1834;
 Hubbard, 1915.
 Pike Co.: Melvin, 1933, 1934; Orton, 1874; Stout,
 1916; Whittlesey, 1838.
 Portage Co.: Hildreth, 1837; Newberry, 1878a;
 Ver Steeg, 1932.

Geomorphology: - continued

- Prairies, origin of: Atwater, 1819; Bourne, 1820;
 Wells, R.W., 1819; Anonymous, 1838.
 Preble Co.: Harker, 1943a; Orton, 1878.
 Putnam Co.: Winchell, N.H., 1874.
 Relief map: U.S.G.S., 1922.
 Richland Co.: Read, 1878.
 Rocky River valley: Donner, 1941; Hubbard, 1925.
 Ross Co.: Campbell, 1918; Davis, W.M., 1884;
 Hildreth, 1834; Hyde, 1921; Melvin, 1933,
 1934; Orton, 1874; Whittlesey, 1838.
 Sandusky Bay: Mosely, 1902, 1905.
 Sandusky Co.: Hubbard, 1925; Mosely, 1905;
 Westgate, 1904; Winchell, N.H., 1873.
 Sandusky River valley: Flynn, 1904; Hubbard, 1925.
 Scioto Co.: Andrews, 1891; Baker, M.V., 1931,
 1931a; Stout, 1916; Whittlesey, 1838, 1838a.
 Seneca Co.: Hubbard, 1925; Winchell, N.H., 1873.
 Shelby Co.: Hussey, 1878.
 Sink holes: Hubbard, 1928; Ver Steeg, 1932b.
 Southeastern Ohio: Andrews, 1871a; Hildreth,
 1836, 1838; Rich, 1939; Stout, 1938b;
 White, G.W., 1938.
 Southern Ohio: Lesley, 1869.
 Southwestern Ohio: Desjardins, 1935; Drake, 1925;
 Nickles, 1905; Rich, 1939.
 Stark Co.: Bognar, 1926; Hildreth, 1837; Newberry,
 1878a; Schaefer, E.J., 1946.
 Summerfield quadrangle: Condit, 1923.
 Summit Co.: Harker, 1944a; Cushing, 1931;
 Hildreth, 1837; Hubbard, 1925; Newberry,
 1873a.
 Trumbull Co.: Hildreth, 1837; Read, 1873.
 Tuscarawas Co.: Briggs, 1838a; Condit, 1912a;
 Cummins, 1947; Newberry, 1878a.
 Union Co.: Winchell, N.H., 1874.
 Van Wert Co.: Winchell, N.H., 1874.
 Vermilion River valley: Hubbard, 1925.
 Vinton Co.: Stout, 1927.
 Warren Co.: Orton, 1878; Wolford, 1927, 1930.
 Washington Co.: Andrews, 1874; Bell, G.L., 1950;
 Frye, 1937; Hildreth, 1826, 1828, 1834;
 Smith, W.H., 1948, 1949; Stauffer, 1920.
 Waterfalls: See Gorges.
 Wayne Co.: Conrey, 1921; Read, 1878a.
 Western Ohio: Busch, 1939.
 Williams Co.: Gilbert, 1871, 1873.
 Wood Co.: Briggs, 1838a; Harker, 1945a; Winchell,
 N.H., 1874.
 Woodsfield quadrangle: Condit, 1923.
 Wyandot Co.: Hubbard, 1925; Winchell, N.H., 1873.
 Geophysical methods: Hammer, 1950; Higgy, 1936,
 1944; Sappenfield, 1950.
 Glacial geology: See also Drainage changes; Pleistocene
 and Recent deposits; Pleistocene and post-
 Pleistocene under Paleobotany.

Glacial geology: - continued

- Abandoned shorelines, Lake Erie Basin: Carman, 1928; Carney, 1909a, 1910a, c, 1911, 1911c, 1913, 1916, 1916a; Claypole, 1887; Gilbert, 1897, 1898a; Hubbard, 1938; Leverett, 1892, 1895, 1898, 1902, 1939; Miller, M., n.d. (a); Moore, 1948; Mosely, 1902, 1905, 1905a; Spencer, 1891; Stout, 1944; Taylor, F.B., 1899, 1911; Upham, 1896; Whittlesey, 1850; Winchell, N.H., 1873a; Wright, G.F., 1890b, 1898a.
- Adams Co.: Leverett, 1892a.
- Allen Co.: Winchell, N.H., 1874.
- Ashland Co.: Hubbard, 1914, 1914a, 1942; Leverett, 1914; Read, 1878a; Ver Steeg, 1932c, 1933a, 1936a; White, G.W., 1933, 1934a, 1937.
- Ashtabula Co.: Carney, 1911c, 1916a; Hubbard, 1942; Hutton, 1940, 1941; Read, 1873; Smith, W.H., 1949a.
- Ashtabula quadrangle: Carney, 1916a; Hutton, 1940, 1941.
- Auglaize Co.: Hubbard, 1942; Winchell, N.H., 1874.
- Bass Islands: Mohr, 1931, 1931a.
- Beaches, raised: See Abandoned shorelines.
- Beech Flats: See White clays.
- Bedrock cavities filled with glacial material: Carman, 1922.
- Bellefontaine quadrangle: Swick, 1941, 1942.
- Bellevue quadrangle: Carney, 1913.
- Bibliography: Leverett, 1902.
- Brown Co.: Herzer, 1878; Wright, G.F., 1890.
- Butler Co.: Bernhagen, 1947a; Fenneman, 1916; Klaer, 1948; Orton, 1878; Wright, G.F., 1890.
- Camp Sherman quadrangle: Campbell, 1918; Hyde, 1921.
- Carroll Co.: Owen, E.W., 1914.
- Champaign Co.: Hill, 1878; Hills, 1916; Moses, 1922.
- Cincinnati region: Brand, 1934; Burke, M.D., 1888; Desjardins, 1933.
- Clark Co.: Brown, D.M., 1948, 1949; Davis, W.M., 1884; Harker, 1943b; Orton, 1873; Rogers, M., 1938, 1938a.
- Clay: Lamborn, 1938.
- Clermont Co.: Harris, S., 1950; Orton, 1873; Wright, G.F., 1890.
- Cleveland region: Bagley, 1950; Cushing, 1931; Williams, A.B., 1940.
- Clinton Co.: Austin, 1930; Hussey, 1878; Kelly, 1937, 1937a.
- Columbiana Co.: Stout, 1924; White, G.W., 1942; Wright, G.F., 1890.

Glacial geology: - continued

- Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.
- Conneaut quadrangle: Hutton, 1940, 1941.
- Coshocton Co.: Hodge, 1878; Owen, E.W., 1914; Ver Steeg, 1933a; White, G.W., 1933, 1937, 1939.
- Crawford Co.: Briggs, 1838a; Foster, 1839; Hubbard, 1942; White, G.W., 1933, 1935a; Winchell, N.H., 1874.
- Cuyahoga Co.: Bagley, 1950; Beach Erosion Bd., 1950; Claasen, 1898, 1907; Cushing, 1931; Davis, W.M., 1884; Hubbard, 1908a; Newberry, 1873a; Pierce, 1897, 1901; Smith, W.H., 1949a; Speckman, 1923; Upham, 1896; Ver Steeg, 1933a; Williams, A.B., 1940; Wright, G.F., 1898.
- Darke Co.: Lindenmuth, 1878.
- Dayton region: Foerste, 1915.
- Defiance Co.: Winchell, N.H., 1874.
- Deformation, of glacial deposits: Carney, 1909b. caused by glacial ice: Glock, 1929, 1929a; Tight, 1891.
- Deglaciation: Claypole, 1887; Goldthwait, 1950a; Ver Steeg, 1932c; White, G.W., 1932, 1934a, 1939c.
- Delaware Co.: Hubbard, 1915; Klippart, 1875; Stauffer, 1911; Westgate, 1926; White, G.W., 1933, 1935a; Winchell, N.H., 1874.
- East Liberty quadrangle: Swick, 1941, 1942.
- Erie Co.: Carney, 1911, 1913; Granger, 1823; Newberry, 1874b; Ver Steeg, 1932b.
- Erratic boulders: See Glacial erratics.
- Eskers: Foerste, 1915; Morse, 1907; Scheffel, 1908; Thompson, J.D., 1914.
- Fairfield Co.: Andrews, 1874; Detmers, 1912; Hyde, 1912; Reutinger, 1941, 1942; White, G.W., 1939; Wright, G.F., 1890.
- Fayette Co.: Bernhagen, 1946; Hussey, 1878; Kelly, 1937, 1937a.
- Fossil wood: See Pleistocene and post-Pleistocene under Paleobotany.
- Fostoria quadrangle: Shaffer, 1937, 1937a, 1942.
- Franklin Co.: Foster, 1838; Glock, 1929, 1929a; Harker, 1944; Hubbard, 1915; Klippart, 1875; Morse, 1907; Orton, 1878a; Prosser, C.S., 1910; Stauffer, 1911.
- Fulton Co.: Gilbert, 1871, 1873; Harker, 1945.
- Gallia Co.: Stout, 1916.
- Geauga Co.: Carney, 1911c; Read, 1871, 1873; Smith, W.H., 1949a.
- General: Atwater, 1820; Carney, 1910c; Claypole, 1882, 1887; Desor, 1852; Foster, 1849; Harper, A.R., 1948; Haas, 1917; Kelly, 1938; Lapham, D., 1832; Leverett, 1893, 1899, 1902;

Glacial geology: - continued

General: - continued

Lyell, 1845; Miller, M., n.d. (b); Mosely, 1905; Newberry, 1869, 1871, 1873, 1874, 1878; Orton, 1888g, 1890e, f, 1893a; Owen, E.W., 1914; Price, 1876; Stout, 1944; Ver-Steeg, 1938; Whittlesey, 1848, 1849a, 1866, 1884a; Wilson, I.T., 1943; Winchell, N.H., 1873b; Wood, 1877; Wright, G.F., 1890a, 1915.

Glacial boundary: See also Moraines.

Chamberlin, T.C., 1884a; Ireland, 1940; Leverett, 1893a, 1902; White, G.W., 1933, 1939; Wright, G.F., 1883, 1884, 1884a, d, 1890.

Wisconsin boundary: White, G.W., 1934b.

Glacial erratics: Atwater, 1826; Bascom, 1896; Brand, 1932; Christy, 1848; Claasen, 1898, 1907; Drake, 1825; Hildreth, 1829; Lapham, D., 1832; Locke, 1841a; Mather, W.W., 1841; Patton, 1925; Rutherford, 1942; Scoville, 1878; Shaler, 1872; Slawson, 1933; Tappan, 1828; White, I.C., 1887; White, G.W., 1939b; Wolford, 1932; Wright, A.A., 1897a; Wright, G.F., 1894; Anonymous, 1894.

Glacial grooves: See Glacial striae and grooves.

Glacial lakes: See also Abandoned shorelines,
Lake Erie Basin.

Hubbard, 1908a, 1914, 1914a, 1922, 1937, 1938a, 1939, 1939a, 1942; Leverett, 1914; Speckman, 1923; Wolfe, 1942.

Glacial map of North America: Flint, R.F., 1945.

Glacial striae and grooves: Carney, 1910; Chamberlin, T.C., 1883; Granger, 1823; Locke, 1838, 1841a; Mather, W.W., 1841; Stoddard, O.N., 1859; Whittlesey, 1867, 1879a, 1884b; Winchell, N.H., 1873a; Wright, G.F., 1891; Anonymous, 1894.

Gravel: See Abandoned shorelines; Eskers; Kames; Outwash; Terraces.

Greene Co.: Goldthwait, 1950; Kelly, 1937, 1937a; Orton, 1874; Prosser, C.S., 1910; Rogers, M., 1938, 1938a.

Grooves: See Glacial striae and grooves.

Ground water, glacial drift as source: See under Ground water.

Hamilton Co.: Bell, 1882; Bernhagen, 1947a; Brand, 1934; Burke, M.D., 1888; Desjardins, 1933; Fenneman, 1916; James, J.F., 1886a, 1888a; Klaer, 1948; Orton, 1873; Wright, G.F., 1890; Wuestner, 1936.

Hancock Co.: Shaffer, 1937, 1937a, 1942; Winchell, N.H., 1874.

Hardin Co.: Hubbard, 1942; Winchell, N.H., 1874.

Henry Co.: Winchell, N.H., 1874.

Highland Co.: Leverett, 1892a; Orton, 1871a; Rogers, J.K., 1936; Wright, G.F., 1890.

Glacial geology: - continued

Hocking Co.: Hohler, 1950; Merrill, 1950; White, G.W., 1939.

Holmes Co.: Cole, G.G., 1918; Hubbard, 1941; Owen, E.W., 1914; Read, 1871, 1878a; Ver Steeg, 1932c, 1933a; White, G.W., 1931, 1931a, 1932, 1933, 1934, 1934a, 1949; Wright, G.F., 1890.

Huron Co.: Carney, 1913; Claypole, 1896c; Hubbard, 1942; Read, 1878.

Illinoian glaciation: See also Glacial boundary; also the various counties.

Carney, 1906a; Conrey, 1930; Harris, S., 1950; Hubbard, 1941; Leverett, 1902; White, G.W., 1937, 1939, 1942.

Interglacial stage: Leverett, 1890.

Jackson Co.: Foster, 1857; Stout, 1916.

Jefferson Co.: Chamberlin, T.C., 1896; Wright, G.F., 1896, 1896a.

Kames: Chamberlin, T.C., 1884.

Kelley's Island: Carney, 1910; Fisher, 1922; Newberry, 1874b; Ver Steeg, 1935; Whittlesey, 1879a; Wright, G.F., 1891.

Knox Co.: Leverett, 1939a; Read, 1878; White, G.W., 1933, 1934a, 1937, 1939; Wright, G.F., 1890.

Lake Co.: Beach Erosion Bd., 1950a; Carney, 1911c; Read, 1873; Smith, W.H., 1949a.

Lake Erie, changes of level: See also Abandoned shorelines.

Fuller, M.L., 1904; Mather, W.W., 1838b; Moore, 1946; Whittlesey, 1838a, 1851, 1875a.

Lake Erie Basin: See also Abandoned shorelines.

Beach Erosion Bd., 1942, 1945; Claypole, 1882; Desor, 1850; Gilbert, 1871c, 1897; Mosely, 1898, 1905; Newberry, 1862, 1869, 1882; Ross, 1950; Spencer, 1882; Stout, 1933; Stroop, 1870; Wilson, I.T., 1943; Wright, G.F., 1884b.

Land tilting: See also Abandoned shorelines; Glacial lakes.

Fuller, M.L., 1904; Hubbard, 1938.

Lawrence Co.: Stout, 1916.

Licking Co.: Carney, 1906, 1906a, 1907, 1909; Detmers, 1912; Foster, 1838; Hildreth, 1828; Leverett, 1939a; Mather, K.F., 1909; Read, 1878; Reutinger, 1941, 1942; Scheffel, 1907; Thompson, J.D., 1914; Tight, 1891, 1894b; White, G.W., 1937, 1939; Wright, G.F., 1890.

Logan Co.: Baker, F.C., 1920a; Hill, 1878; Hubbard, 1942; Moses, 1922; Swick, 1941, 1942.

London quadrangle: Rogers, M., 1938, 1938a.

Lorain Co.: Carney, 1910a, 1911, 1916; Cushing, 1931; Hubbard, 1922; Newberry, 1874b; Ver Steeg, 1933a.

Lucas Co.: Carman, 1922, 1928; Gilbert, 1871, 1873.

Madison Co.: Chamberlin, T.C., 1884; Kelly, 1937,

Glacial geology: - continued

- Madison Co.: - continued
1937a; Orton, 1878; Rogers, M., 1938, 1938a.
- Mahoning Co.: Hildreth, 1837; Newberry, 1878b; Stephenson, 1933, 1934.
- Marion Co.: Hubbard, 1942; Winchell, N.H., 1873.
- Maumee Valley: Emery, n.d.; Gilbert, 1871a, c, 1873; Klippart, 1871.
- Medina Co.: Cushing, 1931; Harker, 1943; Hubbard, 1908a, 1942; Smith, W.H., 1949a; Ver Steeg, 1933a; Wheat, 1878; Wright, G.F., 1912.
- Mercer Co.: Hubbard, 1942; Winchell, N.H., 1874.
- Miami Co.: Hussey, 1878.
- Montgomery Co.: Andrews, 1871d; Foerste, 1915; Locke, 1838; Norris, 1948; Orton, 1870, 1871; Scheffel, 1908.
- Moraines: See also Glacial boundary.
Chamberlin, T.C., 1882, 1883; Cole, G.G., 1918; Leverett, 1892, 1898, 1939; White, G.W., 1935, 1935a, 1939a.
- Morrow Co.: White, G.W., 1933, 1935a; Winchell, N.H., 1874.
- Mount Sterling quadrangle: Kelly, 1937, 1937a.
- Muskingum Co.: Foster, 1838, 1857; Patton, 1925; Reutinger, 1941, 1942; Stout, 1918; White, G.W., 1939.
- Muskingum Valley: Ireland, 1941.
- Newberry's theory: Westgate, 1942.
- Northeastern Ohio: Whittlesey, 1838a, 1869a.
- Northwestern Ohio: Winchell, N.H., 1873a.
- Oberlin quadrangle: Carney, 1916.
- Octa quadrangle: Kelly, 1937, 1937a.
- Ohio Valley: Drake, 1825; King, A.T., 1854; Wright, G.F., 1893.
- Ottawa Co.: Conrey, 1929; Winchell, N.H., 1874.
- Outwash: See also Terraces.
Leverett, 1890a, 1891, 1942; Wright, G.F., 1888.
- Paulding Co.: Winchell, N.H., 1874.
- Perry Co.: Detmers, 1912; Reutinger, 1941, 1942; White, G.W., 1939; Wright, G.F., 1890.
- Pickaway Co.: Andrews, 1874; Hubbard, 1915.
- Pike Co.: Leverett, 1892a; Melvin, 1933, 1934; Orton, 1874; Stout, 1916; Tight, 1895; Wright, G.F., 1890.
- Piketon quadrangle: Melvin, 1933, 1934.
- Portage Co.: Hildreth, 1837; Newberry, 1878a; Redfield, 1844; Smith, W.H., 1949a; Ver Steeg, 1932, 1933a.
- Preble Co.: Harker, 1943a; Orton, 1878.
- Pre-Illinoian glaciation: Desjardins, 1933; Hubbard, 1913a; Ireland, 1943; Leverett, 1902; Stout, 1944.
- Putnam Co.: Winchell, N.H., 1874.
- Raised beaches: See Abandoned shorelines, Lake Erie Basin.

Glacial geology: - continued

- Retreat of glacier: See Deglaciation.
- Richland Co.: Hubbard, 1942; Read, 1878; Ver Steeg, 1932c, 1933a; White, G.W., 1934a, 1935a, 1937, 1939, 1939b.
- Ross Co.: Campbell, 1918; Davis, W.M., 1884; Foster, 1950, 1951; Hyde, 1921; Leverett, 1942; Melvin, 1933, 1934; Orton, 1874; Wright, G.F., 1890.
- Sandusky Co.: Carney, 1913; Winchell, N.H., 1873.
- Scioto Co.: Stout, 1916.
- Seneca Co.: Hubbard, 1942; Shaffer, 1937, 1937a, 1942; Winchell, N.H., 1873.
- Shelby Co.: Hussey, 1878.
- South Charleston quadrangle: Rogers, M., 1938, 1938a.
- Southeastern Ohio: Andrews, 1871a, b, 1874; Hildreth, 1838.
- Southwestern Ohio: Bownocker, 1900; Desjardins, 1935; Fowke, 1898; Fuller, M.L., 1912.
- Springfield quadrangle: Rogers, M., 1938, 1938a.
- Stagnation of glaciers: See Deglaciation.
- Stark Co.: Bognar, 1926; Hildreth, 1837; Hubbard, 1908a; Kazmann, 1949; Newberry, 1878a; Owen, E.W., 1914; Schaefer, E.J., 1946; Ver Steeg, 1933a; White, G.W., 1942; Wright, G.F., 1890.
- Summit Co.: Cushing, 1931; Harker, 1944a; Hubbard, 1942; Newberry, 1873a; Smith, W.H., 1949a; Owen, E.W., 1914; Schaefer, E.J., 1946; Ver Steeg, 1933a.
- Terraces: Andrews, 1860; Brand, 1934; Chamberlin, T.C., 1896; Cole, G.G., 1918; Foster, 1857; Holmes, 1893; Hubbard, 1908; Leverett, 1892b; Lyell, 1845; Wright, G.F., 1890, 1893, 1893a, 1896, 1896a, b; Wuestner, 1936.
- Thornville quadrangle: Reutinger, 1941, 1942.
- Tilted shorelines: See Abandoned shorelines; Glacial lakes.
- Trumbull Co.: Hildreth, 1837; Hubbard, 1942.
- Tuscarawas Co.: Cummins, 1947; Owen, E.W., 1914; Ver Steeg, 1933a; Wright, G.F., 1893a.
- Union Co.: Winchell, N.H., 1874.
- Van Wert Co.: Winchell, N.H., 1874.
- Varved clay: Ross, 1950; White, G.W., 1931; Wilson, I.T., 1943.
- Vinton Co.: Stout, 1927.
- Warren Co.: Dickson, 1940; Orton, 1878; Scoville, 1878; Wolford, 1927, 1930, 1932.
- Washington Co.: Andrews, 1874.
- Wayne Co.: Conrey, 1921; Hubbard, 1908a, 1914, 1914a, 1942; Leverett, 1914; Owen, E.W., 1914; Read, 1878a; Smith, W.H., 1949a; Ver Steeg, 1933a; White, G.W., 1933, 1934a; Wright, G.F., 1912.
- Weathering of glacial deposits: Conrey, 1928, 1930; Harris, S., 1950; Wright, G.F., 1912.

Glacial geology: - continued

- West Sister Island: Gilbert, 1873.
 White clays: Leverett, 1892a; Tight, 1895;
 Westgate, 1930.
 Williams Co.: Gilbert, 1871, 1873.
 Wisconsin glaciation: See also the various counties.
 Conrey, 1928; Goldthwait, 1950a; Leverett,
 1902; White, G.W., 1934b, 1939c, 1942, 1950.
 Wood Co.: Briggs, 1838a; Harker, 1945a; Shaffer,
 1937, 1937a, 1942; Winchell, N.H., 1874.
 Wyandot Co.: Hubbard, 1942; Smith, W.H., 1949a;
 Winchell, N.H., 1873.
 Youngstown region: Stephenson, 1933, 1934.
 Zanesville quadrangle: Reutinger, 1941, 1942.
 Gold (?), Bellville region: Baughman, 1904.
 Geauga Co.: Andrews, 1871b.
 Gravel: See Sand and gravel; See also under Glacial
 geology.
 Greene Co.: See under General geology.
 Ground water:
 General discussion for each of the 88 counties:
 Stout, 1944c.
 Adams Co.: Fuller, M.L., 1912.
 Allen Co.: Winchell, N.H., 1874.
 Analyses, chemical: Foulk, 1925.
 Artesian well, intermittent: Gilbert, 1874.
 Bibliography: Meinzer, 1918.
 Blue Hole: Stout, 1949; Ver Steeg, 1932b.
 Brown Co.: Fuller, M.L., 1912.
 Butler Co.: Bernhagen, 1947a; Fenneman, 1916;
 Fuller, M.L., 1912; Klaer, 1939, 1940, 1948;
 Van Tuyl, 1947.
 Canton area: Schaefer, E.J., 1946.
 Clark Co.: Fuller, M.L., 1912; Harker, 1943b;
 Rogers, M., 1938, 1938a.
 Clermont Co.: Fuller, M.L., 1912.
 Clinton Co.: Fuller, M.L., 1912; Kelly, 1937,
 1937a.
 Coshocton Co.: Potter, W.D., 1938.
 Crawford Co.: Winchell, N.H., 1874.
 Darke Co.: Fuller, M.L., 1912.
 Defiance Co.: Winchell, N.H., 1874.
 Delaware Co.: Hildreth, 1837; Westgate, 1926;
 Winchell, N.H., 1874.
 Erie Co.: Stout, 1949; Ver Steeg, 1932b.
 Fayette Co.: Bernhagen, 1946; Kelly, 1937, 1937a.
 Franklin Co.: Harker, 1944; Newberry, 1861;
 Sullivan, 1856; Van Tuyl, 1947.
 Fulton Co.: Harker, 1945.
 General: Bernhagen, 1947; Leverett, 1897, 1905;
 Ohio Devel. & Publ. Comm., 1944; Ohio
 Water Supply Bd., 1942; Orton, 1899; Ranney,
 1940; Stout, 1934, 1942, 1944, 1944b; Van-
 Tuyl, 1947; Youngquist, 1946, 1949.
 discussion by counties: Stout, 1944c.

Ground water: - continued

- Glacial drift as source: Bernhagen, 1947; Burke,
 M.D., 1888; Leverett, 1897; Orton, 1899;
 Schaefer, E.J., 1946; Van Tuyl, 1947a.
 Greene Co.: Fuller, M.L., 1912; Kelly, 1937, 1937a;
 Norris, 1950; Orton, 1874; Rogers, M., 1938,
 1938a; Van Tuyl, 1947.
 Ground-water levels, in 1947: Van Tuyl, 1948.
 in 1948: Kaser, 1950.
 relation to drought: Ver Steeg, 1932a.
 significance of: Schaefer, E.J., 1946a.
 Hamilton Co.: Bell, T.J., 1882; Bernhagen, 1947a;
 Burke, M.D., 1888; Fenneman, 1916; Fuller,
 M.L., 1912; Klaer, 1939, 1940, 1948; Van-
 Tuyl, 1947.
 Henry Co.: Winchell, N.H., 1874.
 Highland Co.: Fuller, M.L., 1912.
 Huron Co.: Hubbard, 1928.
 Levels: See Ground-water levels.
 Licking Co.: Carney, 1909.
 Logan Co.: Swick, 1941, 1942.
 Madison Co.: Kelly, 1937, 1937a; Orton, 1878;
 Rogers, M., 1938, 1938a.
 Mahoning Valley: Fuller, J.O., 1942.
 Medina Co.: Harker, 1943.
 Miami Co.: Fuller, M.L., 1912.
 Mineral springs: Hildreth, 1837; Leverett, 1897.
 Montgomery Co.: Bernhagen, 1945; Fuller, M.L.,
 1912; Norris, 1948; Van Tuyl, 1947.
 Morrow Co.: Winchell, N.H., 1874.
 Muskingum Co.: Van Tuyl, 1947.
 Ohio Valley: Meinzer, 1935.
 Paulding Co.: Winchell, N.H., 1874.
 Pike Co.: Orton, 1874.
 Preble Co.: Fuller, M.L., 1912; Harker, 1943a.
 Putnam Co.: Winchell, N.H., 1874.
 Richland Co.: Van Tuyl, 1947.
 Ross Co.: Hyde, 1921; Van Tuyl, 1947.
 Sandusky Co.: Hubbard, 1928.
 Southwestern Ohio: Fuller, M.L., 1912; Orton, 1873a.
 Stark Co.: Kazmann, 1949; Schaefer, E.J., 1946;
 Van Tuyl, 1947, 1947a.
 Stream flow, relation to ground water: Cross, W.P.,
 1949.
 Summit Co.: Harker, 1944a.
 Tuscarawas Co.: Cummins, 1947.
 Union Co.: Winchell, N.H., 1874.
 Van Wert Co.: Winchell, N.H., 1874.
 Warren Co.: Fuller, M.L., 1912.
 Washington Co.: Van Tuyl, 1947.
 Water-bearing horizons of Ohio: Orton, 1899;
 Stout, 1944b.
 Water supply, possibilities for, at various places in
 Ohio: Stout, 1944c.
 Water tables, perched: Potter, W.D., 1938.

Ground water: - continued

Williams Co.: Gilbert, 1873, 1874.

Wood Co.: Harker, 1945a.

Guernsey Co.: See under General geology.

Gypsum: See also under Mineralogy.

Bownocker, 1920; Jones, V.E., 1935; Lintner, 1944; Orton, 1888e; Peppel, 1904.

Hamilton Co.: See under General geology.

Hancock Co.: See under General geology.

Hardin Co.: See under General geology.

Harrisburg peneplain: See Erosion surfaces under Geomorphology.

Harrison Co.: See under General geology.

Helium-bearing natural gas: Rogers, G.S., 1921.

Henry Co.: See under General geology.

Highland Co.: See under General geology.

Historical geology: See the various geologic ages.

Hocking Co.: See under General geology.

Holmes Co.: See under General geology.

Huron Co.: See under General geology.

Iron:

Analyses: Stout, 1940a, 1945a.

Athens Co.: Andrews, 1878; Briggs, 1838; Read, 1878b.

Black Band ore: Morris, J.B., 1890.

Bog ore: Stout, 1940a.

Clinton Co.: Foerste, 1891a.

Columbiana Co.: Chamberlain, 1883.

Gallia Co.: McMillin, 1881; Stout, 1916.

General: Carney, 1910b; Ohio General Assembly, 1836; Orton, 1884b, c; Stout, 1945a.

Hanging Rock iron district: Cobb, 1887; Lord, N.W., 1884b; McMillin, 1887; Orton, 1878b.

Highland Co.: Foerste, 1891a.

History of development: Lord, N.W., 1884.

Hocking Co.: Andrews, 1878; Orton, 1878b; Read, 1878b.

Hocking Valley region: Hunt, 1879; Whittlesey, 1877.

Iron ore-bearing formations: Stout, 1945a.

Jackson Co.: Briggs, 1838; Orton 1878b; Roy, 1833.

Lawrence Co.: Briggs, 1838; Lawton, 1885; McMillin, 1881; Maxey, 1940, 1940a; Orton, 1878b; Stout, 1916.

Muskingum Co.: Andrews, 1873.

Oölitic iron ore: Foerste, 1891a.

Perry Co.: Andrews, 1878; Read, 1878b; Whittlesey, 1872.

Petroliferous iron ore: Ireland, 1944.

Samples: Willis, 1886.

Scioto Co.: Briggs, 1838; Orton, 1878b; Stout, 1916.

Southern Ohio: Andrews, 1865; Hunt, 1874, 1881; Kent, 1877.

Tuscarawas Co.: Hildreth, 1837; Ireland, 1944; Morris, J.B., 1890; Newberry, 1878a; Roy, 1884b.

Iron: - continued

Vinton Co.: Orton, 1878b.

Ivorydale well, Hamilton Co.: James, J.F., 1888a.

Jackson Co.: See under General geology.

Jefferson Co.: See under General geology.

Knox Co.: See under General geology.

Lake Co.: See under General geology.

Lake Erie, changes of level: See under Glacial geology.

Origin: See Lake Erie Basin under Glacial geology; also under Drainage changes.

Shore erosion: See Beach erosion under Geomorphology.

Lakes, extinct: See Glacial lakes under Glacial geology.

Land tilting: See under Glacial geology.

Landslides: See under Geomorphology.

"Lias": Hildreth, 1836a.

Licking Co.: See under General geology.

Licking Narrows, age of: Mather, K.F., 1909.

Lime: See under Limestone.

Limestone: See also under the various geologic ages; See also Building stone.

Agricultural limestone: Ohio Chamber of Commerce, 1949.

Analyses: Orton, Jr., 1906; Stout, 1941; U.S.G.S., 1889, 1890a, 1897a.

Barberton underground mine: Stauffer, 1944.

Butler Co.: Locke, 1838.

Clark Co.: Orton, 1873.

Columbiana Co.: Stout, 1924.

Conemaugh formation, limestone resources: Condit, 1912a.

Delaware Co.: Hubbard, 1915; Stauffer, 1911; Westgate, 1926.

Dolomitic limestones: Stout, 1944f.

Eastern Ohio: Lamborn, 1947.

Franklin Co.: Hubbard, 1915; Orton, 1878a; Stauffer, 1911.

Gallia Co.: Stout, 1916.

General: Bownocker, 1915; Hawes, 1884; Lamborn, 1947; Orton, Jr., 1906; Stout, 1939, 1941.

Hamilton Co.: Locke, 1838.

Highland Co.: Rogers, J.K., 1936.

Hocking Co.: Orton, 1878b.

Holmes Co.: White, G.W., 1949.

Jackson Co.: Orton, 1878b; Stout, 1916.

Jefferson Co.: Lamborn, 1930.

Kelley's Island: Ver Steeg, 1935.

Lawrence Co.: Maxey, 1940, 1940a; Orton, 1878b; Stout, 1916.

Lime: Carney, 1910b; Orton, 1888f; Orton, Jr., 1904, 1906.

Maxville limestone: See under Mississippian.

Miami Co.: Locke, 1838.

Microscopic study: Grimsley, 1893.

Montgomery Co.: Locke, 1838.

Limestone: - continued

- Muskingum Co.: Stout, 1918.
 Perry Co.: Flint, N.K., 1948, 1949.
 Preble Co.: Locke, 1838.
 Residues, insoluble: Edwards, 1933; Mitchell, 1935; Priddy, 1938, 1938a.
 Scioto Co.: Orton, 1878b; Stout, 1916.
 Summit Co.: Stauffer, 1944.
 Tuscarawas Co.: Newberry, 1878a.
 Vinton Co.: Orton, 1878b.
 Wayne Co.: Conrey, 1921.
 Western Ohio: Stout, 1939, 1941.

Little Rocky Park: Ver Steeg, 1933.

Logan Co.: See under General geology.

Lucas Co.: See under General geology.

Madison Co.: See under General geology.

Mahoning Co.: See under General geology.

Manganese ore, Geauga Co.: Stout, 1940a.

Mapping: See Surveying and mapping.

Maps: See Geologic maps; Surveying and mapping.

Marion Co.: See under General geology.

Marl deposits: Sterki, 1920; Stout, 1940.
 marl balls: Rouse, 1929.

Medina Co.: See under General geology.

Meigs Co.: See under General geology.

Mercer Co.: See under General geology.

Meteorites:

- Cincinnati area: Cohen, 1898.
 Clark Co.: Nininger, 1942.
 Guernsey Co.: Smith, J.L., 1861.
 Holmes Co.: Ver Steeg, 1935a.
 Muskingum Co.: Andrews, 1860a; Shepard, 1860; Smith, J.L., 1861.
 Perry Co.: Henderson, E.P., 1946.
 Wayne Co.: Smith, J.L., 1864.

Miami Co.: See under General geology.

Mineral industries map: Bownocker, 1928; White, G.W., 1947d.

Mineral resources: See Economic geology; see also the names of specific mineral resources and products.

Mineralogy:

- Barite: Leeds, 1875.
 Calcite: Ford, 1909; Whitlock, 1910.
 Celestite: Bigsby, 1822; Delafield, 1822; Kraus, 1905; Morrison, 1935; Troost, 1822; Wright, G.F., 1898b.
 Clay Center, Ottawa Co.: McAlister, 1946; Mihelcic, 1946, 1947.
 Clay minerals: Cuthbert, 1944; Everhart, 1949.
 Copiapite in coal: McCaughey, 1918.
 Flint Ridge: Schiefer, 1949.
 Fluorescence in glacial gravels: Wuestner, 1936.
 Fluorite: King, F.W., 1944; Morrison, 1935.
 Galena: Ver Steeg, 1940b, 1942.
 Gems: Schiefer, 1936, 1949.

Mineralogy: - continued

- Geodes: Goodwin, 1940.
 Gypsum: Cottingham, 1919; Jones, V.E., 1935; Kraus, 1905a.
 Ironstone concretions: Greene, 1935.
 Pyrite: Tucker, 1919; Van Horn, 1933; Anonymous, 1945.
 Selenite: Birkheimer, 1938; Greene, 1937.
 Soils, changes in: Mickelson, 1943.
 Sphalerite: Greene, 1935; Ver Steeg, 1940b, 1942.
 Travertine: Hubbard, 1928; Stout, 1940a.
 Wurtzite, polymorphous: Frondel, 1950; Seaman, 1950.

Minford silts: Stout, 1931b.

Mississippian (Stratigraphic geology): See also under Paleobotany; Paleontology.

Adams Co.: Locke, 1838.

Ashland Co.: Read, 1878a; Ver Steeg, 1936a, 1947.

Ashtabula Co.: Lesley, 1875; Prosser, C.S., 1912a; Read, 1873.

Athens Co.: Andrews, 1878; U.S.G.S., 1944.

Bedford shale: Cooper, J.R., 1943; Hyde, 1911a.
 fauna: Foerste, 1909a.

nomenclature: Chamberlin, T.C., 1901;

Cumings, 1901; Prosser, C.S., 1901a;

Siebenthal, 1901.

Bedford-Berea unconformity: Burroughs, 1911;

Cushing, 1915; Prosser, C.S., 1912.

Belmont Co.: Condit, 1916a; Griswold, 1908.

Berea sandstone: See also under Oil and gas.

Bownocker, 1915; Burroughs, 1913, 1914;

Cooper, J.R., 1943; Cushing, 1888; Foreman,

1940; Hyde, 1911a; Niles, W.H., 1876;

Orton, 1879, 1882a; Read, 1883; Van Horn,

1931; Verwiebe, 1916; Weidman, 1942.

Black shales: Orton, 1882.

Black Hand sandstone and conglomerate:

Ver Steeg, 1947.

Brine-bearing strata: Stout, 1932.

Cadiz quadrangle: Condit, 1914; Griswold, 1902.

Camp Sherman quadrangle: Hyde, 1921.

Carroll Co.: Condit, 1914; Griswold, 1902.

Clays: Orton, 1893b.

Cleveland region: Cushing, 1931; Williams, A.B., 1940.

Cleveland shale: See under Devonian.

Columbiana Co.: Stout, 1924.

Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.

Conglomerates: Lamb, 1914; Stout, 1944e.

Correlations: Cooper, W.F., 1900; Decker, 1920;

Girty, 1901, 1904; Hall, J., 1842, 1843,

1843a, 1848; Lesley, 1875; Orton, 1879a,

1880; Prosser, C.S., 1912a; Stevenson, 1906;

Verwiebe, 1916, 1917; Whittlesey, 1851a;

Williams, H.S., 1891; Winchell, A., 1869.

Coshocton Co.: Hodge, 1878; Lamb, 1916;

Mississippian: - continued

- Coshocton Co.: - continued
Meyers, T.R., 1929, 1929a.
- Crawford Co.: Briggs, 1838a; Winchell, N.H., 1874.
- Cuyahoga Co.: Brainerd, 1853; Cushing, 1915, 1931; Holden, 1942; Lesley, 1875; Newberry, 1873a; Orton, 1886e; Phalen, 1919; Prosser, C.S., 1912a; Rogers, G.S., 1917; Rothrock, 1949; Van Horn, 1931; Williams, A.B., 1940.
- Cuyahoga shale: Herrick, 1891.
- Delaware Co.: Cooper, J.R., 1943; Hicks, 1878a; Hubbard, 1915; Prosser, C.S., 1912; Stauffer, 1911; Westgate, 1926; Winchell, N.H., 1874.
- Devonian-Mississippian contact: Burroughs, 1914; Cushing, 1912; Hass, 1947; Hicks, 1878; Hyde, 1911a; Kindle, 1912; Ulrich, 1912; Verwiebe, 1917.
- Eastern Ohio: Ashley, 1938; Lockett, 1927; Russell, 1926.
- Erie Co.: Newberry, 1874b.
- Euclid bluestone: Van Horn, 1931.
- Fairfield Co.: Andrews, 1874; Bownocker, 1903a, 1910; Hyde, 1912, 1915; Prosser, C.S., 1904, 1912.
- Flushing quadrangle: Griswold, 1908.
- Franklin Co.: Cooper, J.R., 1943; Foster, 1838; Harker, 1944; Hubbard, 1915; Hyde, 1911a; Orton, 1878a; Prosser, C.S., 1904, 1910, 1912; Stauffer, 1911.
- Fulton Co.: Harker, 1945.
- Gallia Co.: Stout, 1916; U.S.G.S., 1944.
- Geauga Co.: Lesley, 1875; Prosser, C.S., 1912a; Read, 1871, 1873.
- General: Bownocker, 1903; Carney, 1911a; Foster, 1852; Hall, J., 1845; Harper, A.R., 1948; Holden, 1941; Lafferty, 1941; Leverett, 1902; Newberry, 1871, 1871c, 1872a, 1873, 1874a, 1878; Orton, 1871b, 1886, 1888, 1890, 1890e, 1893a; Prosser, C.S., 1901; Stevenson, 1903; Stout, 1945; Whittlesey, 1849a, 1869, 1869a.
- Guernsey Co.: Condit, 1916, 1916a; Griswold, 1908.
- Harrison Co.: Condit, 1914; Griswold, 1902, 1908.
- Highland Co.: Orton, 1871a; Rogers, J.K., 1936.
- Hocking Co.: Andrews, 1878; Bownocker, 1903a; Briggs, 1838a; Carman, 1946; Hohler, 1950; Hyde, 1915; Lesquereux, 1865; Merrill, W.M., 1948, 1949, 1950; Morse, 1910; Orton, 1878b; Ver Steeg, 1933, 1947.
- Holmes Co.: Lamb, 1916; Lamborn, 1949; Read, 1871, 1878a; White, G.W., 1949.
- Huntington quadrangle: Campbell, 1900.
- Huron Co.: Read, 1878.

Mississippian: - continued

- Iron ore-bearing formations: Stout, 1945a.
- Jackson Co.: Morse, 1910; Orton, 1878b; Roy, 1885a; Stout, 1916.
- Jefferson Co.: Condit, 1914; Griswold, 1902, 1907; Lamborn, 1930.
- Knox Co.: Read, 1878; Ver Steeg, 1947.
- Lake Co.: Lesley, 1875; Prosser, C.S., 1912a; Read, 1873.
- Lawrence Co.: Campbell, 1900; Orton, 1878b; Stout, 1916.
- Licking Co.: Bownocker, 1903a; Carney, 1906, 1907, 1908, 1909; Foster, 1838; Herrick, 1887, 1888; Hicks, 1878a; Hildreth, 1837; Holden, 1942; Hyde, 1915; Lamb, 1916; Morse, 1910; Prosser, C.S., 1904, 1910; Read, 1878; Turkopp, 1915; Ver Steeg, 1947.
- Limestones: Bownocker, 1915; Hawes, 1884; Lamborn, 1947; Orton, Jr., 1906; Stout, 1944f.
- Lorain Co.: Burroughs, 1911, 1913, 1914; Cushing, 1915, 1931; Hubbard, 1913; Newberry, 1874b; Prosser, C.S., 1912a.
- Mahoning Co.: Newberry, 1878b; Stephenson, 1933, 1934.
- Maxville limestone: Andrews, 1871c; Lamb, 1916; Lamborn, 1945; Morse, 1910.
bibliography: Morse, 1910.
fauna: Morse, 1911.
- Medina Co.: Cushing, 1931; Harker, 1943; Prosser, C.S., 1912a; Wheat, 1878.
- Meigs Co.: U.S.G.S., 1944.
- Mineral resources: Stout, 1932b.
- Mississippian-Pennsylvanian unconformity:
See under Pennsylvanian.
- Monroe Co.: Condit, 1916, 1916a.
- Morgan Co.: Hildreth, 1833; U.S.G.S., 1944.
- Morrow Co.: Winchell, N.H., 1874.
- Muskingum Co.: Andrews, 1873; Cummins, 1931, 1931a; Foster, 1838; Hildreth, 1837; Lamb, 1916; Morse, 1910; Stevenson, 1878; Stout, 1918; Turkopp, 1915; U.S.G.S., 1944.
- Noble Co.: Condit, 1916, 1916a.
- Nomenclature: Lesley, 1875; Williams, H.S., 1891.
- Northeastern Ohio: Girty, 1901; Prosser, C.S., 1912a; Whittlesey, 1838a, 1853.
- Paleoecology: Dachnowski, 1911.
- Paleogeography: Hyde, 1911a; Rich, 1950.
- Perry Co.: Andrews, 1878, 1879; Bownocker, 1901, 1910; Flint, N.K., 1946, 1947, 1948, 1949; Morse, 1910.
- Pickaway Co.: Andrews, 1874; Hubbard, 1915; Prosser, C.S., 1904, 1912.
- Pike Co.: Bassler, 1911; Holden, 1942; Hyde, 1911a, 1915; Melvin, 1933, 1934; Orton, 1874; Stout, 1916.
- Piketon quadrangle: Melvin, 1933, 1934.

Mississippian: - continued

- Portage Co.: Lesley, 1875; Newberry, 1878a;
Ver Steeg, 1932.
- Richland Co.: Holden, 1942; Read, 1878;
Ver Steeg, 1947.
- Ross Co.: Carman, 1947; Hyde, 1911a, 1915, 1921;
Melvin, 1933, 1934; Orton, 1874.
- Rushville group: Andrews, 1879.
- Sandstones: Hawes, 1884; Stout, 1944e.
- Scioto Co.: Andrews, 1891; Baker, M.V., 1931,
1931a; Hyde, 1911a, 1915; Morse, 1910;
Orton, 1878b; Stout, 1916.
- Sedimentary structures: Cooper, J.R., 1943; Hyde,
1911a; Rich, 1950.
- Shales: Lamborn, 1938.
- Southern Ohio: Andrews, 1865, 1871a, b, c; Briggs,
1838.
- Stark Co.: Newberry, 1878a.
- Steubenville quadrangle: Griswold, 1907.
- Summerfield quadrangle: Condit, 1916.
- Summit Co.: Cushing, 1931; Harker, 1944a;
Hildreth, 1837; Lesley, 1875; Newberry,
1873a; Phalen, 1919; Prosser, C.S., 1912a;
Stauffer, 1944; White, I.C., 1918.
- Sunbury shale: Prosser, C.S., 1902,
fauna: Bucher, 1929.
- Thickness estimate: Lamborn, 1934.
- Trumbull Co.: Lesley, 1875; Prosser, C.S., 1912a;
Read, 1873.
- Tuscarawas Co.: Cummins, 1947.
- Unconformities: Lamb, 1914.
- Vinton Co.: Holden, 1942; Hyde, 1927;
Lesquereux, 1865; Morse, 1910; Orton, 1878b.
- Water-bearing horizons: Orton, 1899; Stout, 1944b.
- Waverly group: Cooper, W.F., 1890; Girty, 1901;
Herrick, 1888, 1889, 1891, 1893; Hicks,
1878a; Hyde, 1915; Mather, W.W., 1838c;
Morse, 1912; Orton, 1879a; Prosser, C.S.,
1901, 1904.
fauna: Cooper, W.F., 1888.
- Wayne Co.: Bonine, 1915; Conrey, 1921; Holden,
1942; Phalen, 1919; Read, 1878a; Ver-
Steeg, 1940a.
- Woodsfield quadrangle: Condit, 1916a.
- Youngstown region: Stephenson, 1933, 1934.
- Mohican State Park: Ver Steeg, 1931a.
- Monroe Co.: See under General geology.
- Montgomery Co.: See under General geology.
- Morgan Co.: See under General geology.
- Morrow Co.: See under General geology.
- Mud cracks: See Sun cracks under Sedimentary structures.
- Muskingum Co.: See under General geology.
- Natural gas: See Oil and gas.
- Nelson Ledge State Park: Ver Steeg, 1932.

Noble Co.: See under General geology.

Nomenclature: See under Stratigraphy (general); also
under the various geologic ages.

Norris well, Hancock Co.: Condit, 1913,
temperature in: Johnston, 1913.

Ohio Geological Survey:

Annual reports: Mather, W.W., 1838, 1838b;
Melvin, 1950; Orton, 1890.

Chemical department: Lord, N.W., 1884a;
Wormley, 1871.

Duties: Melvin, 1950a.

First organization, history: Meisel, 1926; Stoddard,
P.W., 1929.

personnel: Whittlesey, 1885a.

Geological survey of the State, report of committee
on: Ohio General Assembly, 1835, 1836.

History (general): Mendenhall, Thos, C., 1923;
Merrill, G.P., 1906, 1924; Miller, M., n.d.(b);
Newberry, 1870c, 1872a, 1873; Ohio General
Assembly, 1835, 1836, 1859; Orton, 1893, 1894;
Orton, Jr., 1903; Prosser, C.S., 1906; Whittle-
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Ordovician: Miller, S.A., 1874b; Wetherby, 1879.

Cystoidea: See also Echinodermata (general).

Ordovician: Hall, J., 1866; Miller, S.A., 1881a,
1892a.

Silurian: Busch, 1943; Foerste, 1917a, 1920.

Devonian (general): See also the various classes of animals.

Baker, R.C., n.d., 1942; Bownocker, 1898;
Branson, 1911; Carman, 1927b, 1936, 1947;
Claypole, 1903; Cooper, W.F., 1900; Fisher,
1922; Girty, 1912; Hall, J., 1843, 1843a,
1845, 1859; Herzer, 1902a; Kerr, J.E., 1950;
Meek, 1871c, d, 1873; Moses, 1922; New-
berry, 1873; Orton, 1878a; Parker, 1950;
Prosser, C.S., 1905a; Rector, 1950; Reutinger,
1941a; Stauffer, 1906, 1908, 1909, 1911,
1916b, 1938a, 1944; Stewart, 1927, 1930;
Stumm, 1941, 1942, 1945; Swartz, 1907;
Wells, J.W., 1947; Westgate, 1926, 1933;
Williams, H.S., 1886; White, C.A., 1862;
Whitfield, 1882, 1891; Whittlesey, 1851a;
Zuidema, 1946.

Paleontology, invertebrate: - continued

- Echinodermata (general): See also Blastoidea;
Crinoidea; Cystoidea; Edrioasteroidea;
Stelleroidea.
Ordovician: Miller, S.A., 1879b.
Silurian: Foerste, 1919, 1920.
- Edrioasteroidea: See also Echinodermata (general).
Ordovician: Foerste, 1914; James, U.P., 1887;
Shideler, 1918; Williams, S.R., 1918.
Silurian: Foerste, 1920.
- Foraminifera: See Protozoa.
- Fusulinidae: See Protozoa.
- Gastropoda: See also Mollusca (general).
Devonian: Hall, J., 1873, 1879.
questionable Gastropoda: Hall, J., 1888.
Mississippian: Herrick, 1888a; Meek, 1866a.
questionable Gastropoda: Hall, J., 1888.
Ordovician: Bucher, 1938; Hall, J., 1845a,
1861, 1872; James, U.P., 1872, 1874a;
Miller, S.A., 1874d, 1882b, c, 1894.
Pennsylvanian: Hildreth, 1837; Sturgeon,
1936, 1945a; Whitfield, 1881.
Pleistocene and Recent: Baker, F.C., 1920;
Sterki, 1907.
Silurian: Foerste, 1885, 1889, 1923.
- General:
Catalogues: Chappars, 1936; Mather, W.W.,
1842; Morningstar, 1924; Stewart, 1930a.
Collecting localities: Mihelcic, 1947.
Extinction of species: McCreery, 1890.
Limestones, microscopic study: Grimsley, 1893.
Paleozoic: Meek, 1865a, b, 1866.
- Graptozoa: See also Coelenterata (general).
Silurian: Foerste, 1885.
- Ichnolites:
Ordovician: Miller, S.A., 1880.
- Insecta:
Pennsylvanian: Scudder, 1868, 1888.
- Mississippian (general): See also the various
classes of animals.
Bucher, 1929; Carman, 1947; Cooper, W.F.,
1888, 1890, 1900; Foerste, 1909a; Foster,
1852; Herrick, 1888, 1888a, 1889, 1891;
Meek, 1871c, d, 1875; Melvin, 1933, 1934;
Morse, 1911; Prosser, C.S., 1901; Stauffer,
1911; Whitfield, 1882, 1891; Whittlesey,
1851a; Winchell, A., 1865, 1869, 1871.
- Mollusca (general): See also Cephalopoda;
Gastropoda; Pelecypoda.
Ordovician and Silurian: Sharpe, 1848.
Pleistocene and Recent: Baker, F.C., 1920a;
Sterki, 1920.
- Ordovician (general): See also the various classes
of animals.
Austin, 1927; Bucher, 1939, 1945; Chappars,
1935; Dalvé, 1948; Faber, 1886;

Paleontology, invertebrate: - continued

- Ordovician (general): - continued
Foerste, 1903, 1910, 1912a, 1915, 1916, 1919a;
Forsyth, 1946; Hall, J., 1843, 1843a, 1845,
1845a, 1860, 1866, 1872, 1875; Harper, G.W.,
1896; James, J.F., 1888b, 1889b, 1890, 1891,
1892; James, U.P., 1871, 1875, 1878; Lyell,
1845; Meek, 1872a, b, 1873; Mickleborough,
1878; Miller, S.A., 1874, 1875b, 1878, 1878a,
b, 1879, 1880, 1880b, 1881a, b, 1882, 1882b,
c, 1884, 1892a, 1894a; Newberry, 1873, 1874e;
Nickles, 1902, 1903; Orton, 1873, 1878;
Shideler, 1907, 1914; Ulrich, 1878a, 1879,
1880, 1888a, b; Wetherby, 1881; Williams,
S.R., 1910; Wolford, 1927; Anonymous, 1888.
- Ostracoda: See also Crustacea (general).
Devonian: Hendrix, 1939, 1939a; Stewart, 1936,
1939, 1945, 1945a, 1950; Ulrich, 1890c.
Mississippian: Herrick, 1888a; Ulrich, 1890c.
Ordovician: Hall, J., 1872; Jones, T.R., 1890;
Ulrich, 1890c, 1897a; Wetherby, 1881.
Pennsylvanian: Marple, 1950; Stephenson,
1933, 1934.
- Pelecypoda: See also Mollusca (general).
Devonian: Stewart, 1933.
Mississippian: Herrick, 1888a.
Ordovician: Hall, J., 1845a; James, U.P., 1874b;
Miller, S.A., 1874c, e, 1881, 1881a, b, 1882b,
1894, 1894a; Ulrich, 1890a, 1892, 1892a,
1893, 1897; Whitfield, 1878.
Pleistocene and Recent: Sterki, 1907.
Silurian: Foerste, 1885; Miller, S.A., 1881.
- Pennsylvanian (general): See also the various
classes of animals.
Condit, 1909; Conrad, 1841; Foster, 1852;
Hall, J., 1843, 1843a; Herrick, 1887; Laird,
1937; Lesquereux, 1852; Mark, 1910, 1911,
1912; Mix, 1918; Meek, 1871c, d, 1872c,
1875; Morningstar, 1921, 1922; Morton,
1836; Nesbitt, 1930, 1930a; Stephenson,
1933, 1934; Stevens, 1858; Sturgeon, 1933,
1934, 1936, 1937, 1949; Turkopp, 1915;
Whitfield, 1882, 1891.
- Permian (general): Stauffer, 1920.
- Pleistocene and Recent: Baker, F.C., 1920, 1920a;
Sterki, 1907.
- Porifera:
Devonian: Wells, J.W., 1943.
Mississippian: Bucher, 1929; Hall, J., 1863b.
Ordovician: James, J.F., 1885b, 1887; Miller,
S.A., 1882; Ulrich, 1889.
Permian: Herzer, 1901a.
Silurian: Priddy, 1938, 1938a.
- Protozoa:
Foraminifera:
Devonian: Dawson, 1881; Stewart, 1947.

Paleontology, invertebrate: - continued

Protozoa: - continued

Foraminifera: - continued

Silurian: Priddy, 1938, 1938a; Stewart, 1941.

Pennsylvanian: Stephenson, 1933, 1934.

Fusulinidae: See also Foraminifera.

Pennsylvanian: Thompson, M.L., 1936;

Verneuil, 1846; Weller, 1942.

Scolecodonts: See also Annelida.

Devonian: Stauffer, 1939.

Ordovician: Gries, 1934.

Silurian: Foerste, 1888a.

Silurian (general): See also the various classes of animals.

Busch, 1939, 1940, 1943; Carman, 1927b, 1936; Claypole, 1903; Foerste, 1885, 1889, 1893, 1893a, 1895, 1915, 1917a, 1919a, 1920, 1923, 1931; Hall, J., 1845, 1859, 1875; James, U.P., 1878; Kerr, J.E., 1950; McFarlan, 1938; Meek, 1871d, 1872b, 1873; Mohr, 1931, 1931a; Morningstar, 1915; Moses, 1922; Newberry, 1873; Nicholson, 1875d; Orton, 1878; Parker, 1950; Priddy, 1938, 1938a, 1939; Prosser, C.S., 1916b; Rector, 1950; Stauffer, 1911; Whitfield, 1882, 1891.

Stellerioidea: See also Echinodermata (general).

Ordovician: Dana, 1863; Graham, 1846; Locke, 1846; Meek, 1872; Miller, S.A., 1880a, b, 1881a, 1882, 1882b, 1884; Williams, S.R., 1914.

Stromatoporoidea: See also Coelenterata (general).

Devonian: Nicholson, 1875a; Van Cleve, 1849.

Ordovician: James, U.P., 1884, 1884a; Miller, S.A., 1882.

Silurian: Nicholson, 1875a.

Trilobita: See also Crustacea (general).

Devonian: Clarke, 1891; Hall, J., 1888a.

Mississippian: Claypole, 1884, 1884a; Herrick, 1888a; Hildreth, 1837; Vogdes, 1888; Wetherby, 1881.

Ordovician: Anthony, 1838, 1839a; Conrad, 1842; Foerste, 1888, 1909b; Hall, J., 1866; Locke, 1841, 1842, 1842a, 1843a, b; Mickleborough, 1883; Miller, S.A., 1882b, 1893; Taylor, J.S., 1850; Wells, J.W., 1942a; Woodward, H., 1884.

Paleozoic: Green, 1837, 1839, 1839a.

Silurian: Foerste, 1885, 1888, 1889, 1909, 1923; Warder, 1838.

Vermes: See Annelida; Scolecodonts.

Paleontology, vertebrate:

Amphibia: See also Footprints.

Pennsylvanian: Cope, 1871, 1873, 1875, 1875a, b, 1877, 1885; Moodie, 1909, 1915, 1916; Romer, 1930; Steen, 1931; Wyman, 1857a, 1858.

Paleontology, vertebrate: - continued

Conodonts: See also Fish.

Devonian: Bond, 1937, 1937a, 1947; Branson, 1933; Cooper, C.L., 1931; Hass, 1947; Hinde, 1879; Newberry, 1875; Stauffer, 1938.

Mississippian: Hass, 1947.

Ordovician: James, U.P., 1884b.

Pennsylvanian: Sturgeon, 1949a.

Devonian: See Conodonts; Fish.

Fish: See also Conodonts.

Carboniferous: See also Mississippian; Pennsylvanian.

Foster, 1851a; Newberry, 1856c, 1873b, 1875.

Collecting localities: Hyde, 1926.

Devonian: Brainerd, 1853; Branson, 1908, 1908a, 1909, 1911; Claypole, 1888b, 1892a, b, c, 1893, 1893a, b, c, d, e, 1894, 1894a, 1895, 1895b, c, f, g, 1896, 1896a, b, 1897, 1903; Dean, B., 1896, 1899, 1901, 1902, 1911, 1911a; Dunkle, 1939, 1940, 1942, 1942a, 1943, 1945, 1945a, 1946, 1947; Hussakof, 1905, 1911; Hyde, 1926, 1928; Newberry, 1853, 1853e, 1856b, 1857b, 1868a, 1871d, 1873b, 1874k, 1875, 1878c, 1883c, 1885, 1885a, b, 1887, 1888a, 1889; Stauffer, 1909; Wells, J.W., 1943a, 1944; Williams, A.B., 1940; Woodward, A.S., 1938; Wright, A.A., 1893, 1894, 1897.

General: Clark, 1898; Dean, B., 1901a; Newberry, 1888.

Mississippian: See also Carboniferous.

Claypole, 1897b; Cooper, C.L., 1936; Dean, B., 1894.

Pennsylvanian: See also Carboniferous.

Cope, 1873, 1874, 1874a; Hussakof, 1916; Morningstar, 1921; Newberry, 1857c, 1868, 1874g, 1889; Romer, 1930, 1934; Safford, 1853; Wells, J.W., 1944a; Westoll, 1944.

Footprints, Pennsylvanian: Carman, 1927a; Mitchell, 1931, 1933.

Mammalia, Pleistocene: Briggs, 1838; Hay, 1923; Hildreth, 1837; Langdon, 1880; Leidy, 1852; Newberry, 1874f; Safford, 1853; Anonymous, 1875.

Castoroides: Cahn, 1932, 1936; Hay, 1923; Langdon, 1883; Newberry, 1874i; Whipple, 1930.

Elephas: Foster, 1857; Hay, 1923, 1925; Mather, W.W., 1838c; Osborn, 1936; Wyman, 1857.

Mammoth: McClure, W.F., 1904.

Megalonyx: Claypole, 1891; Hay, 1923; Orton, 1891.

Mastodon: Atwater, 1820; Briggs, 1838a; Claypole, 1895a; Foster, 1839, 1849; Gilbert, 1871b; Hay, 1923; Hayes, 1895; Hicks, 1873; Hildreth, 1837; Horner, 1843; Klippart, 1875a; Osborn, 1936; Peat, 1886; Ver Steeg, 1938a, 1944b.

Paleontology, vertebrate: - continued

Mammalia, Pleistocene: - continued

Peccaries: Hay, 1923; Klippart, 1875;
Newberry, 1874h.Ursus: Miller, G.S., 1899.

Mississippian: See under Conodonts; Fish.

Ordovician: See under Conodonts.

Pennsylvanian (general): See also under Amphibia;

Conodonts; Fish; Footprints; Reptilia.

Newberry, 1874j; Romer, 1930.

Permian (general): Burke, J.J., 1935; Stauffer, 1916a.

Pleistocene: See Mammalia.

Reptilia: See also Footprints.

Pennsylvanian: Cope, 1872, 1875a, 1897;

Moodie, 1909; Newberry, 1868; Romer, 1930.

Paulding Co.: See under General geology.

Peat: See also Pleistocene and post-Pleistocene under
Paleobotany.

Cushing, 1931; Dachnowski, 1912; Davis,

C.A., 1912; Hussey, 1878; Ohio Chamber of
Commerce, 1949.

Pennsylvanian (Stratigraphic geology): See also under

Paleobotany; Paleontology. See also Coal.

Allegheny formation: Case, 1917; Sturgeon, 1933,
1934.

fauna: Sturgeon, 1936, 1937.

Appalachian Basin, northern: Cross, A.T., 1950a.

Ashland Co.: Read, 1878a.

Athens Co.: Andrews, 1871b, 1873, 1878; Briggs,

1838a; Condit, 1912a; Hildreth, 1838;

Lovejoy, 1888; Orton, 1884a, 1889a; Read,

1878b; Stauffer, 1920; Sturgeon, 1949;

Whittlesey, 1877.

Barnesville region: Schaefer, J.E., 1928.

Belmont Co.: Andrews, 1874; Brown, C.N., 1888;

Condit, 1912a, 1916a, 1923; Eberle, 1936,

1937; Griswold, 1908; Mitchell, 1929;

Schaefer, J.E., 1928; Stauffer, 1920; Steven-

son, 1873, 1878; White, G.W., 1945a, 1947a.

Brine-bearing strata: Stout, 1932.

Cadiz quadrangle: Condit, 1914; Griswold, 1902.

Camp Sherman quadrangle: Hyde, 1921.

Carroll Co.: Condit, 1912a, 1914; Griswold, 1902;

Lamborn, 1942; Orton, 1884a; Stevenson,

1878; Whittlesey, 1879b.

Clarion clay: Stout, 1932a, 1940.

Clays: See also the names of specific clay horizons.

Bognar, 1935; Orton, 1893b; Orton, Jr., 1884;

Stout, 1923, 1939a.

Cleveland region: Cushing, 1931; Williams, A.B., 1940.

Collecting localities, fossil plants: Stout, 1945b.

Columbiana Co.: Condit, 1912a; Hance, 1925;

Newberry, 1878a; Orton, 1884a; Stout, 1924;

Sturgeon, 1933, 1934, 1936, 1943, 1944; White,

L.C., 1879; Whittlesey, 1874a, 1879b, 1880.

Conemaugh formation: Condit, 1909, 1912a;

Pennsylvanian: - continued

Conemaugh formation: - continued

fauna: Mark, 1912.

Conglomerates: Brainerd, 1851; Hyde, 1908;
Stout, 1944e.Correlations: Decker, 1920; Hall, J., 1842, 1843,
1843a, 1848; Lesley, 1875; Meek, 1865;

Mitchell, 1935; Orton, 1884h; Stevens,

1858a; Stevenson, 1873, 1906; Thiessen,

1923, 1924; Wanless, 1916; Weller, 1942;

White, L.C., 1879; Williams, H.S., 1891.

Coshocton Co.: Hodge, 1878; Meyers, T.R., 1929,

1929a; Orton, 1884a; Orton, Jr., 1884a;

Sturgeon, 1936; Whittlesey, 1879b, 1884c.

Cuyahoga Co.: Cushing, 1931; Lesley, 1875;

Newberry, 1873a; Williams, A.B., 1940.

Cycles of deposition: Cross, A.T., 1949b; Foster,
1852; Stout, 1931a; Willard, 1895.

Dorr Run shale: Sturgeon, 1949.

Flint Ridge: Mark, 1916; Turkopp, 1915.

Flushing quadrangle: Griswold, 1908.

Gallia Co.: Andrews, 1871b, 1873; Condit, 1912a;

Lovejoy, 1888; Orton, 1884a; Stout, 1916;

Wilson, 1950.

Gauga Co.: Lesley, 1875; Read, 1871, 1873.

General: Andrews, 1865, 1871a, b, 1873, 1874a,

1875a; Bownocker, 1903, 1908, 1917, 1929;

Briggs, 1838; Carney, 1910b, 1911a; Foster,

1852; Harper, A.R., 1948; Hildreth, 1836;

Lafferty, 1941; Lesquereux, 1852; Leverett,

1902; Macfarlane, 1873; Newberry, 1871,

1871c, 1872a, 1873, 1874a, d, 1878, 1883;

Orton, 1880, 1882b, 1883a, c, 1884, 1886,

1886c, 1888, 1890, 1890e, 1893a, c; Rogers,

H.D., 1843; Roy, 1883a, 1884c; Stevenson,

1892; Stout, 1919, 1923, 1945, 1947; White,

L.C., 1891; Whittlesey, 1849a, 1854, 1869,

1869a.

Guernsey Co.: Andrews, 1874; Brown, C.N., 1884,

1888; Condit, 1912a, 1916, 1916a, 1923;

Griswold, 1908; Mix, 1918; Nesbitt, 1930,

1930a; Orton, 1884a; Schaefer, J.E., 1928;

Stevenson, 1873, 1878.

Harrison Co.: Condit, 1912a, 1914; Griswold, 1902,

1908; Stevenson, 1873, 1878; White, G.W.,

1947a.

Hocking Co.: Andrews, 1871b, 1878; Briggs, 1838a;

Carman, 1946; Condit, 1912a; Merrill, W.M.,

1948, 1949, 1950; Orton, 1878b, 1884a, 1889a;

Read, 1878b; Sturgeon, 1949; Ver Steeg,

1933; Whittlesey, 1877, 1877a.

Holmes Co.: Orton, 1884a; Read, 1871, 1878a;

White, G.W., 1949.

Huntington quadrangle: Campbell, 1900.

Iron ore-bearing formations: Orton, 1884b; Stout,
1945a.

Pennsylvanian: - continued

- Jackson Co.: Andrews, 1871b; McClure, R.L., 1939; Orton, 1878b, 1884a; Roy, 1883, 1885a, 1894, 1899; Stout, 1916, 1940.
- Jefferson Co.: Brown, C.N., 1888; Condit, 1912a, 1914; Griswold, 1902, 1907; Hance, 1925; Lamborn, 1930; Newberry, 1878b; Orton, 1884a; Stauffer, 1920; Stevenson, 1873.
- Kenova quadrangle: Phalen, 1908, 1912.
- Knox Co.: Read, 1878.
- Lawrence clay: Stout, 1931.
- Lawrence Co.: Andrews, 1871b; Campbell, 1900; Condit, 1912a; Hildreth, 1836a; Maxey, 1940, 1940a; Orton, 1878b, 1884a; Phalen, 1908, 1912; Selby, 1887; Stout, 1916, 1931.
- Licking Co.: Carney, 1906, 1907, 1909; Herrick, 1887; Mark, 1910, 1911, 1916; Orton, 1884a; Prosser, C.S., 1910; Read, 1878; Turkopp, 1915.
- Limestones: Bownocker, 1915; Hawes, 1884; Lamb, 1909, 1910; Lamborn, 1947; Mitchell, 1935; Orton, Jr., 1906; Stout, 1944f.
- Lisbon quadrangle: Sturgeon, 1933, 1934.
- Mahoning Co.: Hildreth, 1837; Lamb, 1909, 1910; Lamborn, 1942; Lesley, 1875; Newberry, 1878b; Orton, 1884a; Stephenson, 1933, 1934; Sturgeon, 1933, 1934, 1936, 1943, 1944; White, I.C., 1879.
- Medina Co.: Cushing, 1931; Harker, 1943; Orton, 1884a; Wheat, 1878.
- Meigs Co.: Andrews, 1873; Condit, 1912a; Hildreth, 1838; Lovejoy, 1888; Stauffer, 1920.
- Mercer limestone: Mark, 1910, 1911.
- Mississippian-Pennsylvanian unconformity: Hyde, 1911; Lamb, 1911; Merrill, 1950; Reutinger, 1941, 1942; Schroyer, 1915; Stephenson, 1933, 1934; Ver Steeg, 1948.
- Monongahela formation: Cross, A.T., 1948, 1949b; Stout, 1928, 1930.
- Monroe Co.: Andrews, 1874; Arkle, 1950, 1950a, 1951; Condit, 1912a, 1916, 1916a, 1923; Cross, A.T., 1948; Stauffer, 1920.
- Morgan Co.: Andrews, 1873; Bartlett, 1950, 1951; Brown, C.N., 1884; Condit, 1912a; Frye, 1937; Hildreth, 1833, 1838; Lovejoy, 1888; Stauffer, 1920.
- Muskingum Co.: Andrews, 1873; Brown, C.N., 1884; Condit, 1912a; Cummins, 1931, 1931a; Foster, 1838; Hildreth, 1838; Laird, 1937; Mark, 1910, 1916; Mitchell, 1935; Mix, 1918; Orton, 1884a; Prosser, C.S., 1910; Stevenson, 1878; Stout, 1918; Sturgeon, 1936; Turkopp, 1915; Whittlesey, 1879b.
- Nomenclature: Lesley, 1875; Orton, 1883a; Prosser, C.S., 1901b; Williams, H.S., 1891.
- Northeastern Ohio: Howells, 1885; Newberry, 1871b;

Pennsylvanian: - continued

- Northeastern Ohio: - continued
- Whittlesey, 1838a, 1853, 1872b.
- Noble Co.: Andrews, 1874; Brown, C.N., 1884; Condit, 1912a, 1916, 1916a, 1923; Frye, 1937; Stauffer, 1920.
- Paleoecology: Case, 1917; Dachnowski, 1911.
- Paleogeography: Fuller, J.O., 1950, 1950a.
- Pennsylvanian-Permian contact: See under Permian.
- Perry Co.: Andrews, 1875b, 1878; Bowen, 1947, 1948; Bownocker, 1901; Condit, 1912a; Flint, N.K., 1946, 1947, 1948, 1949; Hildreth, 1838; Hyde, 1912a; Mark, 1910; Orton, 1884a; Read, 1878b; Whittlesey, 1877a.
- Pike Co.: Orton, 1874; Stout, 1916.
- Portage Co.: Lesley, 1875; Newberry, 1878a; Orton, 1884a; Ver Steeg, 1932; Whittlesey, 1878.
- Portersville member, Conemaugh formation: Laird, 1937.
- Pottsville formation: Stevenson, 1904.
fauna: Morningstar, 1921, 1922.
- Ross Co.: Hyde, 1921.
- Sandstones: Hawes, 1884; Stout, 1944e.
- Scioto Co.: Andrews, 1871b; Baker, M.V., 1931, 1931a; Hildreth, 1836a; Orton, 1878b, 1884a; Stout, 1916.
- Sedimentation: Brainerd, 1851; Gray, 1950.
- Shales: Lamborn, 1938.
- Sharon conglomerate: Bownocker, 1921a; Fuller, J.O., 1947, 1950, 1950a; Lamb, 1911; McClure, R.L., 1939; White, I.C., 1881.
- Stark Co.: Bognar, 1926; Claypole, 1895d; Lamb, 1909, 1910; Newberry, 1878a; Orton, 1884a; Sturgeon, 1936; Whittlesey, 1879b, 1884c.
- Steubenville quadrangle: Griswold, 1907.
- Summerfield quadrangle: Condit, 1916, 1923.
- Summit Co.: Cushing, 1931; Harker, 1944a; Hildreth, 1837; Lesley, 1875; Newberry, 1873a; Orton, 1884a; Stauffer, 1944.
- Thickness estimate: Lamborn, 1934.
- Trumbull Co.: Lesley, 1875; Orton, 1884a; Read, 1873; White, I.C., 1879.
- Tuscarawas Co.: Condit, 1912 a; Cummins, 1947; Newberry, 1878a; Orton, 1884a; Roy, 1884b; Sturgeon, 1936; Whittlesey, 1879b, 1884c.
- Vinton Co.: Andrews, 1871b; Orton, 1878b, 1884a; Stout, 1927, 1932a, 1940.
- Washington Co.: Andrews, 1864, 1874; Bell, G.L., 1950; Condit, 1912a; Cross, A.T., 1948; Frye, 1937; Hildreth, 1838; Smith, W.H., 1948, 1948a, 1949; Stauffer, 1920.
- Water-bearing horizons: Orton, 1899; Stout, 1944b.
- Wayne Co.: Conrey, 1921; Orton, 1884a; Read, 1878a; Ver Steeg, 1948.
- Wellsville quadrangle: Hance, 1925.

Pennsylvanian: - continued

- Woodsfield quadrangle: Condit, 1916a, 1923.
 Youngstown region: Stephenson, 1933, 1934.
- Permian (Stratigraphic geology): See also under
 Paleobotany; Paleontology. See also Coal.
- Athens Co.: Andrews, 1873; Hildreth, 1838;
 Stauffer, 1920.
- Belmont Co.: Andrews, 1874; Condit, 1916a, 1923;
 Eberle, 1936, 1937; Mitchell, 1929; Schaefer,
 J.E., 1928; Stauffer, 1920; Stevenson, 1878;
 White, G.W., 1945a.
- Brine-bearing strata: Stout, 1932.
- Clays: Bognar, 1935; Stout, 1923.
- Collecting localities, fossil plants: Stout, 1945b.
- Cycles of deposition: Cross, A.T., 1949b.
- Dunkard series: Cross, A.T., 1948, 1949b; Stauffer,
 1916a, 1920.
- General: Andrews, 1875a; Bownocker, 1917, 1929;
 Briggs, 1838; Carney, 1911a; Harper, A.R.,
 1948; Lafferty, 1941; Leverett, 1902;
 MacFarlane, 1873; Newberry, 1871, 1873;
 Orton, 1888, 1890, 1893a; Stauffer, 1916a;
 Stevenson, 1892; Stout, 1919; White, L.C.,
 1891.
- Jefferson Co.: Griswold, 1907; Lamborn, 1930;
 Stauffer, 1920.
- Limestones: Stout, 1944f.
- Meigs Co.: Andrews, 1873; Hildreth, 1838;
 Stauffer, 1920.
- Monroe Co.: Andrews, 1874; Arkle, 1950, 1950a,
 1951; Condit, 1916a, 1923; Cross, A.T.,
 1948; Stauffer, 1920.
- Morgan Co.: Andrews, 1873; Frye, 1937; Hildreth,
 1838; Stauffer, 1920.
- Muskingum Co.: Cummins, 1931, 1931a; Stout,
 1918.
- Noble Co.: Frye, 1937; Stauffer, 1920.
- Pennsylvanian-Permian contact: Frye, 1938;
 White, G.W., 1947a.
- Sandstones: Stout, 1944e.
- Shales: Lamborn, 1938.
- Steubenville quadrangle: Griswold, 1907.
- Summerfield quadrangle: Condit, 1916.
- Thickness estimate: Lamborn, 1934.
- Washington Co.: Andrews, 1874; Bell, G.L., 1950;
 Cross, A.T., 1948; Frye, 1937; Hildreth, 1838;
 Smith, W.H., 1948, 1948a, 1949; Stauffer,
 1920.
- Water-bearing horizons: Orton, 1899; Stout, 1944b.
- Woodsfield quadrangle: Condit, 1916a.
- Perry Co.: See under General geology.
- Petroleum: See Oil and gas.
- Petrology:
- Celestite-bearing rocks: Kraus, 1905.
- Cherts, Devonian, origin: Westgate, 1929.
- Clays, coal-formation: Stout, 1923.

Petrology: - continued

- Conglomerates: Stout, 1944e.
- Black Hand conglomerate: Ver Steeg, 1947.
- Sharon conglomerate: Fuller, J.O., 1947.
- Dolomite: Mihelcic, 1946; Stout, 1941.
- Greenfield dolomite: Wells, J.W., 1942.
- Flint: Stout, 1945.
- Limestones: Stout, 1941.
- Delaware limestone: Westgate, 1933.
- Detroit River limestone: Stumm, 1945.
- Maxville limestone: Lamborn, 1945.
- Pennsylvanian: Mitchell, 1935.
- Marl: Stout, 1940a.
- Pre-Cambrian: Condit, 1913.
- Residues, insoluble: See under Limestones.
- Sands: Bownocker, 1921a, 1923; Condit, 1912.
- Beach sands: Lundahl, 1941; Pettijohn, 1932,
 1933, 1941.
- Sandstones: Stout, 1944e.
- Berea sandstone: Foreman, 1940; Weidman, 1942.
- Black Hand sandstone: Ver Steeg, 1947.
- Cambrian: Pye, 1946.
- Clay-bonded: Henderson, H.B., 1916.
- Hillsboro sandstone: Carman, 1930; Schillhahn,
 1929.
- Oil-field sandstones: Goldman, 1917.
- Sylvania sandstone: Carman, 1936.
- Shales: Lamborn, 1938.
- Travertine: Stout, 1940a.
- Tufa: Stout, 1940a; Swinnerton, A.A., 1939.
- Vance well, Pye, 1946; Stout, 1940b.
- Physiography: See Geomorphology; Glacial geology.
- Pickaway Co.: See under General geology.
- Pike Co.: See under General geology.
- Pleistocene and Recent deposits: See also Glacial geology;
 Sedimentation.
- Ashtabula Co.: Bownocker, 1923.
- Butler Co.: Bownocker, 1923.
- Columbiana Co.: Hance, 1925.
- Eastern Ohio: Hice, 1905.
- Erie Co.: Bownocker, 1923; Sterki, 1920.
- Gallia Co.: Bownocker, 1923; Wilson, 1950.
- Greene Co.: Rouse, 1929.
- Hamilton Co.: Bownocker, 1923; Doroshenko, 1948.
- Hocking Co.: Merrill, W.M., 1948, 1949.
- Jefferson Co.: Hance, 1925.
- Lake Erie: Ross, 1950.
- Lawrence Co.: Phalen, 1912.
- Marl deposits: Rouse, 1929; Sterki, 1920; Stout,
 1940a.
- Morgan Co.: Frye, 1937.
- Muskingum Co.: Bownocker, 1918, 1923.
- Noble Co.: Frye, 1937.
- Portage Co.: Sterki, 1920.
- Scioto Co.: Baker, M.V., 1931, 1931a.
- Stream deposits: Doroshenko, 1948; Griffin, 1943.

Pleistocene and Recent deposits: - continued

Travertine: Stout, 1940a.

Tufa: Stout, 1940a.

Vesiculated mud: Griffin, 1943.

Washington Co.: Frye, 1937.

Pollen analysis: See Pleistocene and post-Pleistocene under Paleobotany.

Portage Co.: See under General geology.

Portland cement: See Cement materials.

Preble Co.: See under General geology.

Pre-Cambrian: Hubbard, 1932; U.S.G.S., 1945b.

Clark Co., Friend well: Wasson, 1932.

Delaware Co., Vance well: Stout, 1940b.

Hancock Co., Norris well: Condit, 1913.

Putnam Co.: See under General geology.

Pyrite: See under Mineralogy.

Quaternary: See Glacial geology; Pleistocene and Recent deposits.

Reames Cave: Hills, 1916.

Recent deposits: See Pleistocene and Recent deposits.

Relief features of Ohio: See Geomorphology.

Relief map of Ohio: U.S.G.S., 1922.

Residues, insoluble: See under Limestones.

Richland Co.: See under General geology.

Ripple marks: See under Sedimentary structures.

Rock House: Carman, 1946; Ver Steeg, 1933.

Ross Co.: See under General geology.

Salt: See also Brines.

Deposits: Baltimore & Ohio R.R., 1948; Bownocker, 1905, 1906; Carney, 1910b; Conrey, 1921; Cushing, 1931; Gambs, 1946; Pepper, 1947; Phalen, 1919; White, I.C., 1918.

History of development of salt industry: Bownocker, 1906; Harris, 1945; Hildreth, 1838; Root, 1888; Stout, 1932.

Sand: See also Sand and gravel.

Beach sand: Lundahl, 1941; Pettijohn, 1932, 1933, 1941.

Glass sand: Bownocker, 1926; Burchard, 1907; Carney, 1908, 1910b.

Molding sand: Bownocker, 1918, 1921a, 1923; Carney, 1910b; Conrey, 1921; Ohio Chamber of Commerce, 1949; Williams, D.C., 1949; Wilson, 1950.

Petrographic character of Ohio sands: Condit, 1912.

Sand and gravel. See also Sand; also Gravel under Glacial geology.

Ashtabula Co.: Hutton, 1940, 1941; Smith, W.H., 1949a.

Clark Co.: Brown, D.M., 1948, 1949; Rogers, M., 1938, 1938a.

Clinton Co.: Kelly, 1937, 1937a.

Cuyahoga Co.: Cushing, 1931; Smith, W.H., 1949a.

Erie Co.: Carney, 1911.

Fayette Co.: Kelly, 1937, 1937a.

Geauga Co.: Smith, W.H. 1949a.

Sand and gravel: - continued

General: Baker, G.C., 1947.

Greene Co.: Kelly, 1937, 1937a; Rogers, M., 1938, 1938a.

Highland Co.: Rogers, J.K., 1936.

Lake Co.: Smith, W.H., 1949a.

Lorain Co.: Carney, 1911; Cushing, 1931.

Madison Co.: Kelly, 1937, 1937a; Rogers, M., 1938, 1938a.

Mahoning Co.: Stephenson, 1933, 1934.

Medina Co.: Cushing, 1931; Smith, W.H., 1949a.

Montgomery Co.: Foerste, 1915; Scheffel, 1908.

Muskingum Co.: Bownocker, 1918.

Northern Ohio: Smith, W.H., 1949a.

Pike Co.: Stout, 1916.

Portage Co.: Smith, W.H., 1949a.

Ross Co.: Hyde, 1921.

Summit Co.: Cushing, 1931; Smith, W.H., 1949a.

Wayne Co.: Smith, W.H., 1949a.

Wyandot Co.: Smith, W.H., 1949a.

Sand-lime brick: Peppel, 1905.

Sandstone: See also under the various geologic ages;

See also Building stone.

Adams Co.: Andrews, 1891.

Analyses: Burchard, 1907; Brainerd, 1874; U.S.G.S., 1886, 1890, 1890b, c, 1897.

Artificial sandstone: Peppel, 1905.

Clay-bonded sandstones: Henderson, H.B., 1916.

Columbiana Co.: Stout, 1924.

Cuyahoga Co.: Cushing, 1931.

Gallia Co.: Hildreth, 1821.

General: Bownocker, 1915; Hawes, 1884; Stout, 1944e.

Holmes Co.: White, G.W., 1949.

Lorain Co.: Burroughs, 1913; Cushing, 1931.

Medina Co.: Cushing, 1931.

Perry Co.: Flint, N.K., 1948, 1949.

Pike Co.: Stout, 1916.

Ross Co.: Hyde, 1921.

Scioto Co.: Andrews, 1891.

Summit Co.: Cushing, 1931.

Sandusky Co.: See under General geology.

Scenic features: See also Geomorphology; State parks.

General: Carman, 1946; Stout, 1945d.

Outline of tours: Wright, G.F., 1915.

Scioto Co.: See under General geology.

Sedimentary structures:

Flow markings: Rich, 1950.

Flow structures: Cooper, J.R., 1943.

Ripple marks: Foerste, 1917; Hyde, 1911a; James, J.F., 1889; Prosser, C.S., 1916a; Sanger, 1935.

Sun cracks: Braun, 1916; Foerste, 1895; Perry, 1889.

Wave marks: Foerste, 1895; James, J.F., 1885; Perry, 1889.

Sedimentation: See also Sedimentary structures.

Artificial lake: Mitchell, 1937.

Lake Erie: Ross, 1950.

Miami valley reservoir: Lane, E.W., 1940.

Pennsylvanian: Brainerd, 1851; Gray, 1950.

Reservoir silting: Sanderson, 1948.

Sandusky Bay: Wilson, I.T., 1943.

Silurian: Swain, 1947; U.S.G.S., 1949a.

Stream deposits, structures and textures:

Doroshenko, 1948.

vesiculated mud: Griffin, 1943.

Seneca Co.: See under General geology.

Shale: See also under the various geologic ages;

See also Oil shale.

Analyses: U.S.G.S., 1897.

Black shales: Ashley, 1917; Newberry, 1883a;

Orton, 1882, 1883; Rominger, 1876.

Cuyahoga Co.: Cushing, 1931; Van Horn, 1916.

Franklin Co.: Ashley, 1917.

General: Lamborn, 1938.

Lorain Co.: Cushing, 1931.

Medina Co.: Cushing, 1931.

Perry Co.: Flint, N.K., 1948, 1949.

Summit Co.: Cushing, 1931.

Tuscarawas Co.: Ireland, 1944.

Shelby Co.: See under General geology.

Silurian (Stratigraphic geology): See also under

Paleobotany; Paleontology.

Adams Co.: Foerste, 1895, 1896, 1929; Locke, 1838; McFarlan, 1938; Orton, 1871a.

Allen Co.: Orton, 1888b; Winchell, N.H., 1874.

Ashtabula Co.: Rector, 1950.

Auglaize Co.: Winchell, N.H., 1874.

Bass Islands: See also Islands, Lake Erie.

Mohr, 1931, 1931a.

Belfast bed: Foerste, 1896.

Bellefontaine outlier: Moses, 1922.

Bellefontaine quadrangle: Swick, 1941, 1942.

Brassfield limestone: Cummins, 1931b.

Brine-bearing strata: Stout, 1932.

Cedarville dolomite, fauna: Foerste, 1920.

Champaign Co.: Hill, 1878; Moses, 1922.

Cincinnati Silurian island hypothesis: See Cincinnati arch under Structure.

Clark Co.: Foerste, 1896, 1929; Harker, 1943b;

Orton, 1873; Rogers, M., 1938, 1938a.

Clays: Orton, 1893b.

Cleveland district: Cushing, 1931.

Cliff limestone: Orton, 1871a.

Clinton Co.: Foerste, 1888a, 1896; Hussey, 1878.

Clinton group: Foerste, 1885, 1891a, 1893, 1895, 1896; Orton, 1871a.

Clinton sand: See also under Oil and gas.

Bownocker, 1911a; Lockett, 1949; Russell, 1926; Swain, 1947.

Silurian: - continued

Columbiana Co.: Stout, 1924.

Columbus quadrangle: Hubbard, 1915; Stauffer, 1911.

Coral reefs: Cumings, 1930.

Correlations: Ball, 1939; Foerste, 1900, 1923, 1929, 1935; Hall, J., 1842, 1843, 1843a, 1848; McFarlan, 1938.

Coshocton Co.: Meyers, T.R., 1929, 1929a.

Cuyahoga Co.: Cushing, 1931; Neff, 1890; Orton, 1886e; Phalen, 1919; Rogers, G.S., 1917; Rothrock, 1949; Van Horn, 1917.

Darke Co.: Lindenmuth, 1878.

Dayton region: Foerste, 1915.

Delaware Co.: Carman, 1927b; Stout, 1940b;

Westgate, 1926; Winchell, N.H., 1874.

Detroit River series: See under Devonian.

Dolomites: Stout, 1941, 1944f.

East Liberty quadrangle: Swick, 1941, 1942.

Eastern Ohio: Ashley, 1938; Lockett, 1927; Pepper, 1947; Russell, 1926.

Erie Co.: Bownocker, 1920; Lintner, 1944;

Newberry, 1874b; Peppel, 1904; Ver Steeg, 1932b; White, G.W., 1926.

Fairfield Co.: Bownocker, 1903a, 1910.

Fayette Co.: Bernhagen, 1946; Hussey, 1878.

Fostoria quadrangle: Shaffer, 1937, 1937a.

Franklin Co.: Harker, 1944; Hubbard, 1915;

Newberry, 1861; Orton, 1878a; Stauffer, 1911.

Gallia Co.: Stout, 1916.

General: See also Southwestern Ohio.

Bownocker, 1903; Carney, 1911a; Claypole, 1903; Hall, J., 1845; Harper, A.R., 1948; Lafferty, 1941; Leverett, 1902; Newberry, 1871, 1871c, 1872a, 1873, 1878; Orton, 1871b, 1886, 1888, 1890, 1890e, 1893a; Stout, 1945; U.S.G.S., 1949a; Whittlesey, 1849a.

Greene Co.: Foerste, 1896, 1920; Carman, 1946; Norris, 1950; Orton, 1874; Prosser, C.S., 1910; Rogers, M., 1938, 1938a.

Greenfield dolomite: Grabau, 1898; Napper, 1916, 1917; Wells, J.W., 1942.

Guelph limestone: Nicholson, 1875d.

Hancock Co.: Condit, 1913; Orton, 1885, 1888b; Shaffer, 1937, 1937a; Winchell, N.H., 1874.

Hardin Co.: Winchell, N.H., 1874.

Henry Co.: Winchell, N.H., 1874.

Highland Co.: Carman, 1929, 1930; Foerste, 1895, 1896, 1929; McFarlan, 1938; Napper, 1916, 1917; Orton, 1871a; Prosser, C.S., 1916b; Rogers, J.K., 1933, 1936; Schillhahn, 1929; White, G.W., 1926.

Hillsboro sandstone: See under Devonian.

Hocking Co.: Bownocker, 1903a.

Holmes Co.: Lamborn, 1949.

Silurian: - continued

- Iron ore-bearing formations: Stout, 1945a.
 Islands, Lake Erie: Carman, 1946; Gilbert, 1873; Mohr, 1931, 1931a; Newberry, 1874b; White, G.W., 1926.
 Jackson Co.: Stout, 1916.
 Lawrence Co.: Stout, 1916.
 Licking Co.: Bownocker, 1903a.
 Limestones: See also the names of specific limestone horizons, Bownocker, 1915; Hawes, 1884; Orton, 1888f; Orton, Jr., 1906; Stout, 1941.
 Logan Co.: Hill, 1878; Moses, 1922; Swick, 1941, 1942.
 London quadrangle: Rogers, M., 1938, 1938a.
 Lorain Co.: Cushing, 1931; Hubbard, 1913; Parker, 1950.
 Lucas Co.: Carman, 1928, 1936; Gilbert, 1871, 1873; Stauffer, 1908.
 Madison Co.: Orton, 1878; Rogers, M., 1938, 1938a.
 Map, early Silurian rocks: U.S.G.S., 1949a.
 Marion Co.: Cumings, 1930; Winchell, N.H., 1873.
 Medina Co.: Cushing, 1931.
 Mercer Co.: Winchell, N.H., 1874.
 Miami Co.: Hussey, 1878; Foerste, 1896; Locke, 1838; White, G.W., 1926.
 Mineral resources: Stout, 1932b.
 Momroe group: Carman, 1927; Lane, A.C., 1908; Napper, 1916.
 Montgomery Co.: Foerste, 1896, 1915; Locke, 1838; Norris, 1948; Orton, 1871.
 Muskingum Co.: Cummins, 1931, 1931a; Stout, 1918; Swain, 1950.
 Niagara group: Busch, 1939, 1939a, 1940; Edwards, 1933; Orton, 1871a; Priddy, 1938, 1938a, 1939; Prosser, C.S., 1916.
 fauna: Morningstar, 1915.
 Northeastern Ohio: Claypole, 1895e.
 Northwestern Ohio: Carman, 1934, 1936; Orton, 1886d; Rogers, W.B., 1842; Stauffer, 1916.
 Ordovician-Silurian boundary: Foerste, 1896, 1900, 1904; Shideler, 1916.
 Ottawa Co.: Bownocker, 1920; Jones, V.E., 1935; Kerr, J.E., 1950; Lintner, 1944; Mohr, 1931, 1931a; Orton, 1888e; Peppel, 1904; White, G.W., 1926; Winchell, N.H., 1874.
 Paleogeology: Dachnowski, 1911.
 Paleogeography: Rittenhouse, 1949; U.S.G.S., 1949a.
 Paulding Co.: Winchell, N.H., 1874.
 Perry Co.: Bownocker, 1910.
 Pickaway Co.: Hubbard, 1915.
 Pike Co.: Bassler, 1911; Orton, 1874; Stout, 1916.
 Portage Co.: Jones, V.E., 1935.
 Preble Co.: Foerste, 1896; Locke, 1838; Harker, 1943a; Orton, 1878.

Silurian: - continued

- Putnam Co.: Winchell, N.H., 1874.
 Ross Co.: Carman, 1947; Orton, 1874; White, G.W., 1926.
 Salina group: Claypole, 1895e; Newberry, 1873e.
 Sandstones: Stout, 1944e.
 Sandusky Co.: Cumings, 1930; Winchell, N.H., 1873.
 Scioto Co.: Stout, 1916.
 Sedimentary structures: Foerste, 1895; Prosser, C.S., 1916a.
 Sedimentation: Swain, 1947; U.S.G.S., 1949a.
 Seneca Co.: Cumings, 1930; Shaffer, 1937, 1937a; White, G.W., 1926; Winchell, N.H., 1873.
 Shales: Lamborn, 1938.
 Shelby Co.: Hussey, 1878; White, G.W., 1926.
 Silurian-Devonian contact: See under Devonian.
 South Charleston quadrangle: Rogers, M., 1938, 1938a.
 Southwestern Ohio: Andrews, 1865; Bassler, 1906; Briggs, 1838; Foerste, 1891, 1900, 1904, 1909, 1917a, 1919a, 1923; Fuller, M.L., 1912; Grabau, 1898; Hall, J., 1874; Miller, A.M., 1898; Miller, S.A., 1874a; Sharpe, 1848; Van Cleve, 1849.
 Springfield quadrangle: Rogers, M., 1938, 1938a.
 Summit Co.: Cushing, 1931; Phalen, 1919; Stauffer, 1944; White, I.C., 1918.
 Sylvania sandstone: See under Devonian.
 Thickness estimate: Lamborn, 1934.
 Tuscarawas Co.: Cummins, 1947.
 Union Co.: Winchell, N.H., 1874.
 Van Wert Co.: Winchell, N.H., 1874.
 Warren Co.: Foerste, 1896; Orton, 1878.
 Water-bearing horizons: Orton, 1899; Stout, 1944b.
 Wayne Co.: Bonine, 1915; Conrey, 1921; Phalen, 1919; Ver Steeg, 1940a.
 West Sister Island: See also Islands, Lake Erie, Gilbert, 1873.
 Western Ohio: Busch, 1939, 1939a, 1940; Carman, 1927; Orton, 1888b, 1889; Prosser, C.S., 1916; Stout, 1941.
 Wood Co.: Harker, 1945a; Orton, 1885, 1888b; Shaffer, 1937, 1937a; Winchell, N.H., 1874.
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- Counties:
- | | | |
|-----------|-----------|------------|
| Adams | Geauga | Ottawa |
| Athens | Lake | Paulding |
| Auglaize | Licking | Putnam |
| Belmont | Logan | Scioto |
| Brown | Lucas | Stark |
| Butler | Marion | Trumbull |
| Clermont | Miami | Vinton |
| Coshocton | Muskingum | Washington |
| Fulton | | |
- Cities:
- | | | |
|-----------|----------|-------------|
| Cleveland | Columbus | Westerville |
|-----------|----------|-------------|
- Weathering, effect on composition of soil: Mickelson, 1943.
- Spring Valley gorge, origin of: Scheffel, 1907.
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- Stark Co.: See under General geology.
- State House well: Mather, W.W., 1859; Newberry, 1861.
- State parks:
- Hocking State Parks: Carman, 1946; Ver Steeg, 1933.
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Structure: - continued

- Adams Co.: - continued
- Sappenfield, 1950.
- Anticlines: Dunn, 1949; Van Horn, 1910a.
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- Ashland Co.: Ver Steeg, 1947.
- Ashtabula Co.: Hutton, 1940, 1941.
- Athens Co.: U.S.G.S., 1944.
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- Butler Co.: Orton, 1873.
- Cadiz quadrangle: Condit, 1914; Griswold, 1902.
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- Central Ohio: Sharp, 1932.
- Cincinnati arch: Carney, 1911a; Dennis, 1888; Foerste, 1891, 1899, 1900a, 1904; Forsyth, 1946; Hubbard, 1924; Lockett, 1938; Miller, A.M., 1898; Newberry, 1873; Orton, 1890e.
- Clermont Co.: Orton, 1873.
- Columbiana Co.: Stout, 1924.
- Columbus quadrangle: Hubbard, 1915.
- Coshocton Co.: Meyers, T.R., 1929, 1929a; Robinson, 1927.
- Cryptovolcanic structure: Bucher, 1921, 1925, 1928, 1933, 1935; Sappenfield, 1950.
- Cuyahoga Co.: Cushing, 1931; Rogers, G.S., 1917; Rothrock, 1949; Van Horn, 1910a.
- Deformation by ice thrust: Glock, 1929, 1929a.
- Delaware Co.: Hubbard, 1915; Westgate, 1926.
- Domes, Put-in-Bay: Cottingham, 1919; Kraus, 1905a.
- Eastern Ohio: Ashley, 1938; Cottingham, 1927; Fettke, 1938; Lockett, 1927, 1937; Macfarlane, 1873; Orton, 1888c; Pepper, 1947; Richardson, 1928; Russell, 1926; U.S.G.S., 1946a; Whittlesey, 1869.
- Fairfield Co.: Bownocker, 1903a, 1910.
- Faulting in coal seam: Huston, 1883.
- Flushing quadrangle: Griswold, 1908.
- Folds, minor: Hutton, 1940, 1941; Decker, 1916, 1920.
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- by glacial ice sheet: Tight, 1891.
- Franklin Co.: Hubbard, 1915; Sullivant, 1856.
- Gallia Co.: U.S.G.S., 1944; Wilson, 1950.
- General: Billingsley, 1934; Carney, 1911a; Cottingham, 1926; Fuller, M.L., 1917; Holden, 1942; Lafferty, 1941; Lockett, 1947, 1949; Newberry, 1873; Orton, 1886, 1888, 1890, 1890e, 1893a; Stout, 1935, 1938a; U.S.G.S., 1945b, 1949a; Ver Steeg, 1944.
- Greene Co.: Norris, 1950.

Structure: - continued

- Guernsey Co.: Condit, 1916, 1916a, 1923; Griswold, 1908; Lockett, 1937; Mix, 1918.
- Hamilton Co.: Orton, 1873.
- Harrison Co.: Condit, 1914; Griswold, 1902, 1903, 1908; Orton, 1890; White, G.W., 1947a.
- Hocking Co.: Bownocker, 1903a; Merrill, W.M., 1948, 1949, 1950; Ver Steeg, 1947; Whittlesey, 1873a, 1877a.
- Holmes Co.: Lamborn, 1949.
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- Jackson Co.: Ede, 1895.
- Jefferson Co.: Condit, 1914; Griswold, 1902, 1903, 1907.
- Jointing: Cook, 1926; Ver Steeg, 1942a.
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- Lawrence Co.: Maxey, 1940, 1940a; Phalen, 1912.
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- Lucas Co.: Carman, 1928.
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- Monroe Co.: Arkle, 1950, 1951; Condit, 1916, 1916a, 1923.
- Morgan Co.: Bartlett, 1950, 1951; Frye, 1937; U.S.G.S., 1944.
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- Noble Co.: Condit, 1916, 1916a, 1923; Frye, 1937; Minshall, 1888.
- Northeastern Ohio: Decker, 1920; U.S.G.S., 1946, 1946c.
- Northern Ohio: Burroughs, 1911; U.S.G.S., 1945a, 1949.
- Northwestern Ohio: Bownocker, 1903; Carman, 1934; Ley, 1935; Orton, 1890.
- Perry Co.: Bownocker, 1910; Flint, N.K., 1948, 1949; Whittlesey, 1873a, 1877a.
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- Richland Co.: Ver Steeg, 1947.
- Ross Co.: Orton, 1874.
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- Southwestern Ohio: Braun, 1916; Foerste, 1904; Locke, 1838; Priddy, 1938, 1938a.
- Stark Co.: Lamb, 1910.
- Steubenville quadrangle: Griswold, 1907.
- Summerfield quadrangle: Condit, 1916, 1923.
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- Tuscarawas Co.: Cummins, 1947.
- Vinton Co.: Panyity, 1917.
- Warren Co.: Orton, 1873.
- Washington Co.: Bell, G.L., 1950; Frye, 1937; Minshall, 1888; Smith, W.H., 1948, 1948a, 1949.
- Wayne Co.: Bonine, 1915; Ver Steeg, 1940a.
- West-central Ohio: Busch, 1939.
- Western Ohio: Foerste, 1891; Orton, 1888b, 1889; Panyity, 1921; Stout, 1941.
- Wood Co.: Harker, 1945a.
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- Summit Co.: See under General geology.
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- Travertine: Stout, 1940a.
- Trumbull Co.: See under General geology.
- Tufa: Stout, 1940a.
- Tuscarawas Co.: See under General geology.
- Underground water: See Ground water.
- Union Co.: See under General geology.
- Vance well, Delaware Co.: Pye, 1946; Stout, 1940b.
- Van Wert Co.: See under General geology.
- Vinton Co.: See under General geology.
- Warren Co.: See under General geology.
- Washington Co.: See under General geology.
- Water, underground: See Ground water.
- Wave marks: See under Sedimentary structures.
- Waverly deep well, Pike Co.: Bassler, 1911.
- Wayne Co.: See under General geology.
- Williams Co.: See under General geology.
- Wood Co.: See under General geology.
- Wyandot Co.: See under General geology.