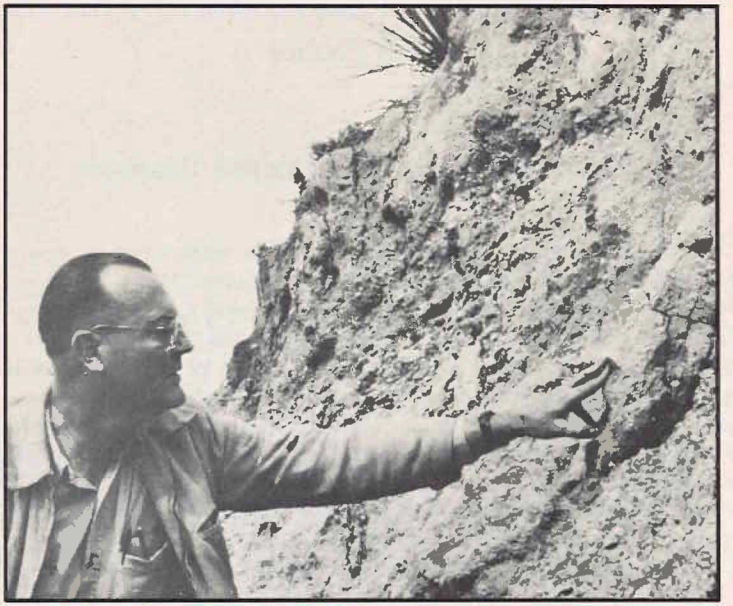

OKLAHOMA GEOLOGICAL SURVEY
THE UNIVERSITY OF OKLAHOMA
NORMAN, OKLAHOMA 73069
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OKLAHOMA GEOLOGY NOTES

Cover Picture

Field Studies of Carl Colton Branson

Dr. Carl C. Branson's geological interests were wide in scope, both temporally and geographically. During his 13 years (1954-67) as director of the Oklahoma Geological Survey, his major interest was in the stratigraphy of Oklahoma, and he was particularly interested in the Pennsylvanian Period. However, the cover photograph was taken in April 1965 at an outcrop of the Rexroad Formation (Pliocene) in Mead County, Kansas. The reason for Carl's interest in the Rexroad Formation was that he was trying to equate it to Pliocene formations in Oklahoma. One of his last publications dealt with fossil fresh-water sponges contained in deposits of the Laverne Formation (Pliocene) of Harper County, Oklahoma (1967, Oklahoma Academy of Science Proceedings, v. 47, p. 162-163).

For details of Carl's career, see the memorial, page 224 of this issue.

—*L. R. Wilson*

Editorial staff: William D. Rose, Rosemary Croy, Elizabeth A. Ham

Oklahoma Geology Notes is published bimonthly by the Oklahoma Geological Survey. It contains short technical articles, mineral-industry and petroleum news and statistics, an annual bibliography of Oklahoma geology, reviews, and announcements of general pertinence to Oklahoma geology. Single copies, seventy-five cents; yearly subscription, $3.00. All subscription orders should be sent to the address on the front cover.

Short articles on aspects of Oklahoma geology are welcome from contributors. A set of guidelines will be forwarded on request.

This publication, printed by the Transcript Press, Norman, Oklahoma, is issued by the Oklahoma Geological Survey as authorized by Title 70, Oklahoma Statutes 1971, Section 3310, and Title 74, Oklahoma Statutes 1971, Sections 231-238. 1,500 copies have been prepared for distribution at a cost to the taxpayers of the State of Oklahoma of $2,243.65.

OKLAHOMA GEOLOGICAL SURVEY

ANNUAL REPORT

July 1, 1974-June 30, 1975

INTRODUCTION

For more than 65 years the Oklahoma Geological Survey has responded to its constitutionally mandated responsibility of investigating the land, water, mineral, and energy resources of our State and disseminating the results of these investigations in order to promote the responsible utilization of natural resources consistent with sound environmental practice. Reliably and repeatedly, the Survey has responded to a variety of State needs with accurate and timely information.

These responses have been possible because throughout its history the Survey has maintained a broad program of basic and applied research. Because of its continued emphasis on research, the Survey is confident that it can meet its responsibilities with respect to the current energy situation, and it will be prepared to cope with additional obligations in relation to emerging shortages of metals and industrial minerals.

ENERGY PROGRAMS

The 1975 fiscal year was particularly noteworthy for Oklahoma. Energy shortages in the State caused some price adjustments in energy costs and a prodigious increase in the value of gross mineral production for the State. This increase in the value of mineral production was reflected in increased drilling activity for oil and gas (3,057 wells were completed in 1974) and in the development of new coal mines (12 new mines were opened during the 1974-75 fiscal year, bringing the total in operation in Oklahoma to 22, as of July 1, 1975).

In the 1974 calendar year, the value of all minerals produced in Oklahoma was about $2.2 billion, almost 50 percent more than in 1973, and, as expected, fossil fuels continued to account for about 95 percent of the total value.

With fuel so important to our State's economy, the Survey continued the thrust initiated during the preceding fiscal year on energy-related studies. Significant among these studies is a research project recently completed on the Hunton Group in the Anadarko basin. An important aspect of the study, which will be published early in 1976 as Survey Bulletin 121, is an interpretation of the distribution of porosity and permeability in these

rocks as a function of facies control. Our expectation is that such data will greatly aid in the search for favorable accumulations of natural gas in the deeper parts of the Anadarko basin. A companion study on the Hunton Group of the Arkoma basin will be initiated in the next fiscal year.

An examination of the occurrence of heavy oil in shallow (commonly less than 1,000 feet) Pennsylvanian strata of northeastern Oklahoma was begun during the past fiscal year. This study is part of a cooperative three-state program (involving Oklahoma, Kansas, and Missouri) that will evaluate the potential of these heavy-oil-bearing units for future energy-resource development. The first stage of the study will be to evaluate data derived from previous drilling in the region. Subsequently, a series of cross sections will be prepared to determine the distribution of the sandstone units and to attempt to evaluate the heavy-oil saturation. A series of cores will be drilled to provide control data on saturation, followed by an appraisal of the concentration and extent of the heavy oil.

An important result of this study will be an assessment of the resource potential of heavy oil in northeastern Oklahoma. Supplementary studies will provide a chemical characterization of the reservoir fluids, as well as a mineralogical and textural description of the reservoir rocks. These studies will provide the data necessary for subsequent evaluation of proposed heavy-oil recovery methods.

Studies of other heavy-oil deposits in Oklahoma will be considered as personnel and financial resources become available. A preliminary assessment of heavy-oil occurrences in strata of the Simpson Group in the Arbuckle Mountains has been made, and all evidence suggests that these occurrences deserve more detailed scrutiny.

Coal investigations in eastern Oklahoma continued to occupy an important position in the Survey's overall program. The Survey's final report to the Ozarks Regional Commission, *Investigation of the Coal Reserves in the Ozarks Section of Oklahoma and Their Potential Uses,* has been an important contribution to a general understanding of the State's coal resources. The report was released in July 1974; almost 1,000 copies have been distributed, and a third printing is contemplated early in the next fiscal year.

Two projects on coal resources were initiated toward the end of the current fiscal year. A small study, funded in part by the U.S. Geological Survey, involves a systematic sampling of the coal beds from each active mine in the State. A comprehensive, analytical study of these samples will provide basic data on the coal chemistry as well as important base-line data on associated trace elements that have a potentially damaging environmental impact. The sampling program will be completed early in the next fiscal year.

A second project, funded in part by a grant from the U.S. Bureau of Mines, involves a detailed study of the Hartshorne coal in Latimer and Le Flore Counties. This 2-year study will provide detailed information on coal distribution and thickness as well as important data on roof-rock conditions and other factors related to the minability of the coal.

Consultation with companies, state and federal agencies, and private individuals concerning coal continues to occupy a significant amount of staff time. The intensity of activity in coal development in Oklahoma is readily apparent from the number of new mines established during the past fiscal year, and expansion of activities during the coming fiscal year is expected to continue at a similar rate.

Various other energy-related duties were performed by the Survey during the past fiscal year. These included an assessment of the occurrence and extent of geopressured zones in the Anadarko basin, compilation and publication of annual statistics on Oklahoma's petroleum industry, continued maintenance of The University of Oklahoma Core and Sample Library, and the initiation of a microfilm file of electrical logs and other well data.

MINERAL-RESOURCES PROGRAMS

Survey projects involving metallic- and industrial-mineral occurrences in the State continued at a relatively constant level throughout the fiscal year.

Copper, lead, and zinc occur in minor concentrations in a variety of geologic environments in the State. A study is under way to locate and describe each of these metallic occurrences in order to evaluate their distribution and to assess the potential for the discovery of larger, economic concentrations. The large number of metallic-mineral prospects in the Ouachita Mountains of southeastern Oklahoma suggests that this province deserves a comprehensive examination. In a similar manner, trends of metallic mineralization are suggested by plotting such occurrences in the Arbuckle Mountains. Finally, a better understanding of the origin of copper in Permian red-bed strata may be aided by examining plots of copper mineralization in these strata.

Oklahoma's industrial-mineral production remains a relatively small, but important, part of the State's total production of natural resources. The potential exists for substantial expansion in the production of many currently produced mineral commodities (as well as for new development of metallic and other industrial minerals), and information currently being compiled by the Survey will be important in achieving this expansion. The intensity of our effort remains small for any one mineral commodity, but continuing studies of important industrial minerals include commodities such as limestone, dolomite, high-silica sand, gypsum, salt, and clays (including underclays).

Although data are meager at present, the prospects for underclay development are especially promising. If sufficient quantities of underclay with suitable mineralogical and chemical properties are delineated in eastern Oklahoma, the potential will exist for development of an operation that will produce light-colored bricks. Since all buff-colored brick is now imported into the State, such a development should be viable economically.

WATER-RESOURCES INVESTIGATIONS

The 10-year water-investigations program undertaken in cooperation with the Water Resources Division of the U.S. Geological Survey continued as an important Survey activity. Two hydrologic atlases were published during the past fiscal year: HA-3, the Ardmore-Sherman sheet, and HA-4, the Oklahoma City sheet. Cartographic preparation of HA-5, the Clinton quadrangle, is well advanced, and this sheet will be published during the next fiscal year.

Detailed studies of the Antlers Sandstone in southeastern Oklahoma and the Vamoosa Formation in east-central Oklahoma are part of a second phase of the cooperative program with the U.S. Geological Survey. These studies are designed to provide comprehensive information on important aquifers in the State, which will aid in evaluating the potential for further ground-water development. In addition, these studies will supply important base-line data on water quality that can be used to monitor and control environmental damage to these water supplies.

During the next few years, the State will face a series of decisions involving important natural resources. Among these is the issue of transferring water from eastern to western Oklahoma. Water-resources studies stemming from the cooperative program with the U.S. Geological Survey will be helpful in providing data to aid in the objective analysis of the proposed plan.

ENVIRONMENTAL-GEOLOGY PROGRAMS

Although a major emphasis of the Survey has been, and continues to be, acquisition of information pertaining to natural-resources development, an activity of growing importance is environmental geology.

The Survey, in cooperation with the Oklahoma Department of Mines, recently completed an investigation of surface mining for coal in Oklahoma. GM-17, *Maps and Description of Disturbed and Reclaimed Surface-Mined Coal Lands in Eastern Oklahoma,* which was published during the 1974-75 fiscal year, employed 3 map sheets and an accompanying booklet to show the results of this investigation. An important goal of the study was to locate and assess the status of some 27,000 acres of "orphan" mined lands—unreclaimed land that was strip-mined prior to the enactment of current reclamation regulations.

The Survey has now undertaken a 3-year study, funded in part by a grant from the U.S. Geological Survey, that will examine past and present mining activity in each of Oklahoma's 77 counties (excluding coal fields). Data will be compiled on each surface-mine location, including the extent of mining and the commodity being mined, the tonnage removed, the time that mining operations took place, and the extent of reclamation of the mined area.

Other environmental projects of a geologic nature that were examined by the Survey during the past year include compiling information on the proposed nuclear-power plant at Inola, investigating geologic factors associated with highway construction projects, and making recommendations about sites for sanitary landfills. Because the Survey has added an engineering geologist to the staff, further expansion of these activities is expected in the next fiscal year.

PUBLIC SERVICE

The Survey recognizes its role as both a scientific and a service agency concerned with the development of a better understanding of the State's natural resources. Therefore, communication is the single most important word in the Survey's vocabulary; the importance of effective communication, providing information on the results of the Survey's many investigative programs, is our most important activity. The Survey attempts to facilitate communication through direct contact with industry personnel, state and federal employees, and private individuals. We arrange personal consultations, public presentations, field conferences, course offerings, and publications. An important continuing objective of the Survey is to devise new strategies for communicating with more citizens of our State.

ACKNOWLEDGMENT

For more than 65 years, the Oklahoma Geological Survey has enjoyed the reputation of being a progressive, responsible State agency. However, many of the accomplishments of this organization would not have been possible without the cooperation and support of other state and federal agencies, business and industrial organizations, several professional organizations, and countless concerned individuals. To each individually and to all collectively, the staff of the Oklahoma Geological Survey joins me in expressing our appreciation for the encouragement, assistance, and support of all concerned.

Charles J. Mankin, *Director*

APPENDIX A
Survey Staff, 1974-75 Fiscal Year

Professional

Thomas W. Amsden

Rosemary L. Croy

Robert O. Fay

David A. Foster

S. A. Friedman

Kenneth S. Johnson

Charles J. Mankin

John F. Roberts

William D. Rose

T. L. Rowland[1]

Leonard R. Wilson

Dah Cheng Wu[2]

Part-Time Professional

George G. Huffman
(The University of Oklahoma)

A. J. Myers
(The University of Oklahoma)

James H. Stitt
(University of Missouri, Columbia)

John B. Thuren[3]
(The University of Oklahoma)

Technical

Cartographic

Marion E. Clark

Roy D. Davis

David M. Deering

Christine G. Pflegl[4]

Sondra L. Underwood

Core and Sample Library

Billy D. Brown

Eldon R. Cox

Editorial

Elizabeth A. Ham

Electron Microscope Technician

William F. Chissoe III[5]

Geological Technician

Eugene R. Parris[6]

Robert D. Wingate[7]

Secretarial

Betty J. Bellis[8]

Helen D. Brown

Margarett K. Civis

Cynthia K. Trettevik

Gwendolyn C. Williamson

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[1]Resigned August 1974.
[2]Appointed August 1974; resigned October 1974.
[3]Appointed permanent part-time March 1975.
[4]Appointed July 1974.
[5]Reappointed August 1974.
[6]Deceased September 1974.
[7]Appointed October 1974.
[8]Appointed August 1974.

APPENDIX B

List of Survey Publications Issued, 1974-75 Fiscal Year

New Publications

Bulletin 119.—*Late Ordovician and Early Silurian Articulate Brachiopods from Oklahoma, Southwestern Illinois, and Eastern Missouri,* by Thomas W. Amsden. 154 pages, 51 figures, 28 plates, 13 tables. Issued February 1975.

Geologic Map, GM-17.—*Maps and Description of Disturbed and Reclaimed Surface-Mined Coal Lands in Eastern Oklahoma, Showing Acreage Disturbed and Reclaimed Through June 1973,* by Kenneth S. Johnson. 3 maps, scale 1:125,000; 12-page booklet, 11 figures, 2 tables. Issued August 1974.

Hydrologic Atlas 3.—*Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,* by Donald L. Hart, Jr. 4 color sheets including geologic map, scale 1:250,000. Published cooperatively with the U.S. Geological Survey. Issued October 1974.

Hydrologic Atlas 4.—*Reconnaissance of the Water Resources of the Oklahoma City Quadrangle, Central Oklahoma,* by Roy H. Bingham and Robert L. Moore. 4 color sheets including geologic map, scale 1:250,000. Published cooperatively with the U.S Geological Survey. Issued June 1975.

Oklahoma Geology Notes.—Six bimonthly issues (August 1975-June 1975), containing 232 pages.

Publications Reprinted

Bulletin 67.—*Geology and Mineral Resources of Haskell County, Oklahoma,* by Malcolm C. Oakes and M. M. Knechtel. 134 pages. Issued 1948; reprinted, without photographs or plates but with line drawings and tables, March 1975.

Bulletin 68.—*Geology and Coal and Natural Gas Resources of Northern Le Flore County, Oklahoma,* by M. M. Knechtel. 76 pages. Issued 1949; reprinted, without photographs or plates but with line drawings and tables, March 1975.

Bulletin 118.—*Models of Sand and Sandstone Deposits: A Methodology for Determining Sand Genesis and Trend,* by John W. Shelton. 122 pages, 141 figures, 3 tables. Issued October 1973; reprinted June 1975.

Coal Report, Final Report to the Ozarks Regional Commission, July 10, 1974.—*An Investigation of the Coal Reserves in the Ozarks Section of Oklahoma and Their Potential Uses,* by S. A. Friedman. 117 pages, 24 figures, 77 tables. Issued July 1974; reprinted October 1974.

Geologic Map.—*Geologic Map of Haskell County, Oklahoma,* by Malcolm C. Oakes and M. M. Knechtel. Scale 1 inch equals 1 mile. Issued 1948, as plate 1 of Bulletin 67; reprinted, without color, May 1975.

Guidebooks for 1973 annual meeting of The Geological Society of America.—*Igneous Geology of the Wichita Mountains and Economic Geology of Permian Rocks in Southwest Oklahoma,* by Kenneth S. Johnson and Rodger E. Denison, with contributions by Douglas C. Brockie, Hugh E. Hunter, and Nancy L. Scofield. Guidebook for Field Trip No. 6. 33 pages, 35 figures, 9 tables. Issued November 1973; reprinted August 1974.

Regional Geology of the Arbuckle Mountains, Oklahoma, by William E. Ham, compiled by T. L. Rowland, with contributions by Thomas W. Amsden, Rodger E. Denison, James R. Derby, Robert O. Fay, A. Allen Graffham, T. L. Rowland, Richard L. Squires, and James H. Stitt. Guidebook for Field Trip No. 5. 56 pages, 50 figures. Issued November 1973; reprinted March 1975.

APPENDIX C

Publications by Survey Staff, 1974-75 Fiscal Year

THOMAS W. AMSDEN

Late Ordovician and Early Silurian articulate brachiopods from Oklahoma, southeastern Illinois, and eastern Missouri: Oklahoma Geological Survey Bulletin 119, 154 p.

ROSEMARY L. CROY

Environmental-geology class maps Lincoln Park: The Sooner Geologist, v. 7, p. 3-8.

Oklahoma Geology Notes: Oklahoma Geological Survey, v. 34, nos. 4-6; v. 35, nos. 1-3, 232 p. (ed., with William D. Rose and Elizabeth A. Ham).

The Sooner Geologist: University of Oklahoma Foundation of Geology and Geophysics, v. 7, 48 p. (ed., with Elizabeth A. Ham).

U.S. Bureau of Mines and State Legislative Council sponsor field trip: Oklahoma Geology Notes, v. 34, p. 206-207.

ROBERT O. FAY

The Berwyn Conglomerate: Oklahoma Geology Notes, v. 34, p. 193-194 (cover photo and description).

Geologic map, *in* Reconnaissance of the water resources of the Oklahoma City quadrangle, central Oklahoma: Oklahoma Geological Survey Hydrologic Atlas 4 (prepared in cooperation with U.S. Geological Survey), Sheet 1 (of 4), scale 1:250,000 (with Roy H. Bingham and Robert L. Moore).

Map of bedrock geology, and Map of alluvium and terrace deposits of Quaternary age, *in* Reconnaissance of the water resources of the Ardmore and Sherman quadrangles, southern Oklahoma: Oklahoma Geological Survey Hydrologic Atlas 3 (prepared in cooperation with U.S. Geological Survey), Sheet 1 (of 4), scale 1:250,000 (with Donald S. Hart, Jr.).

Origin of Petroleum II, a summary review: Oklahoma Geology Notes, v. 34, p. 149-152.

The type species of *Mortoniceras* and the holotype specimens of Lower Cretaceous *Texigryphaea* of the southwestern United States: Oklahoma Geology Notes, v. 35, p. 43-57.

S. A. FRIEDMAN

Interstate Mining Compact Commission views Oklahoma operations: Oklahoma Geology Notes, v. 34, p. 189.

Oklahoma, *in* Seam analyses and description of U.S. coal fields, *part 9 of* 1974 Keystone Coal Industry Manual: New York, McGraw Hill, Inc., p. 535-538.

Oklahoma coal versus Wyoming coal: Oklahoma Geology Notes, v. 35, p. 59.

ELIZABETH A. HAM

Bibliography and index of Oklahoma geology, 1974: Oklahoma Geology Notes, v. 35, p. 83-121 (compiler, with William D. Rose).

Facies and the Reconstruction of Environments, a review: Oklahoma Geology Notes, v. 34, p. 203-204.

Oklahoma Geology Notes: Oklahoma Geological Survey, v. 34, nos. 4-6; v. 35, nos. 1-3, 232 p. (ed., with William D. Rose and Rosemary L. Croy).

The Sooner Geologist: University of Oklahoma Foundation of Geology and Geophysics, v. 7, 48 p. (ed., with Rosemary L. Croy).

State of the State on topo map coverage: Oklahoma Geology Notes, v. 34, p. 155-157.

KENNETH S. JOHNSON

Eagle-Picher closes Creta copper mine and mill: Oklahoma Geology Notes, v. 35, p. 122.

The Enid flood report: an appraisal: Oklahoma Geology Notes, v. 35, p. 27.

Gypsum-capped mesa in southwestern Oklahoma: Oklahoma Geology Notes, v. 35, p. 41-42 (cover photo and description).

Maps and description of disturbed and reclaimed surface-mined coal lands in eastern Oklahoma, showing acreage disturbed and re-

claimed through June 1973: Oklahoma Geological Survey GM-17 (prepared in cooperation with Oklahoma Department of Mines), 3 maps, scale 1:125,000, accompanied by 12-page text.

Medicine Bluffs, Wichita Mountains: Oklahoma Geology Notes, v. 35, p. 1-2 (cover photo and description).

The mineral industry of Oklahoma, *in* Area reports: domestic, *v. 2 of* Minerals yearbook 1972: U.S. Bureau of Mines, p. 549-563 (with L. G. Southard and J. F. Roberts).

Permian copper shales of southwestern United States, *in* Bartholome, Paul, coordinator, Gisements stratiformes et provinces cuprifères: Belgian Geological Society, Centenaire de la Societé Geologique de Belgique, Liège, September 9-13, 1974, p. 383-393.

Stratigraphy of the Permian Blaine Formation and associated strata in north-central Texas [abstract]: American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists Annual Meetings Abstracts, v. 2, p. 39-40 (with W. D. Wolfe and M. V. Smith; reprinted in Oklahoma Geology Notes, v. 35, p. 128).

Tombstone topography in Arbuckle Group, Wichita Mountains: Oklahoma Geology Notes, v. 35, p. 81-82 (cover photo and description).

CHARLES J. MANKIN

Oklahoma, *in* Summary of state activities: The State Geologists Journal (Association of American State Geologists), v. 27, p. 40-41.

Oklahoma Geological Survey annual report, July 1, 1973-June 30, 1974: Oklahoma Geology Notes, v. 34, p. 171-183.

JOHN F. ROBERTS

The mineral industry of Oklahoma, *in* Area reports: domestic, *v. 2 of* Minerals yearbook 1972: U.S. Bureau of Mines, p. 549-563 (with L. G. Southard and K. S. Johnson).

Statistics of Oklahoma's petroleum industry, 1973: Oklahoma Geology Notes, v. 34, p. 195-202 (abstract printed in Petroleum Abstracts, v. 14, p. 469).

WILLIAM D. ROSE

Bibliography and index of Oklahoma geology, 1974: Oklahoma Geology Notes, v. 35, p. 83-121 (compiler, with Elizabeth A. Ham).

Field excursion, circa 1911: Oklahoma Geology Notes, v. 34, p. 133-134 (cover photo and description).

Geologic map of the United States, a review: Oklahoma Geology Notes, v. 35, p. 65-67.

News-release handbook for local public information chairmen: American Association of Petroleum Geologists, 24 p. (compiler).

Oklahoma Geology Notes: Oklahoma Geological Survey, v. 34, nos. 4-6; v. 35, nos. 1-3, 232 p. (ed., with Rosemary L. Croy and Elizabeth A. Ham).

LEONARD R. WILSON

A microscope-slide-mounting technique for exchange of palynological materials: Review of Palaeobotany and Palynology, v. 19, p. 233-234.

Okcol, a water-miscible mountant for palynology: Oklahoma Geology Notes, v. 34, p. 190-191.

Presentation of the Paleontological Society Medal to John West Wells: Journal of Paleontology, v. 49, p. 574-575.

APPENDIX D

Papers Presented by Survey Staff at Professional Meetings, 1974-75 Fiscal Year

Bachelor of Liberal Studies Program, Triannual Natural Science Seminar
Norman, Oklahoma, July18, 1974
KENNETH S. JOHNSON
Mineral resources and environmental concern

Interstate Mining Compact Commission, Fall Meeting
Muskogee, Oklahoma, September 6, 1974
S. A. FRIEDMAN
Coal resources, coal mining industry, coal uses; and mined-land reclamation, laws, procedures, and costs in Oklahoma
KENNETH S. JOHNSON
Inventory of strip-mined lands in Oklahoma coal fields

Belgian Geological Society 100th Anniversary Meeting, Special 5-Day Symposium on "Gisements Stratiformes et Provinces Cuprifères"
Liège, Belgium, September 12, 1974
KENNETH S. JOHNSON
Permian copper shales of southwestern United States

Oklahoma City Geological Society, Monthly Meeting
Oklahoma City, Oklahoma, September 12, 1974
CHARLES J. MANKIN
Role of the Oklahoma Geological Survey in the development of the State's mineral and energy resources

Civil Service Commission, Officials' Meeting
Dallas, Texas, September 19, 1974
CHARLES J. MANKIN
Energy resources of the southwestern United States

Oklahoma Science Teachers Association, Fall Meeting
Tulsa, Oklahoma, October 17, 1974
KENNETH S. JOHNSON
Coal mining and land reclamation in eastern Oklahoma

Paleontological Society of America, Annual Meeting
Miami, Florida, November 19, 1974
LEONARD R. WILSON
Presentation of the Paleontological Society Medal to John West Wells

Oklahoma Chapter of American Metals Society and Society of Mining Engineers of America, Joint Monthly Meeting
Oklahoma City, Oklahoma, December 11, 1974
S. A. FRIEDMAN
Coal industry and future coal developments in Oklahoma

Ardmore Geological Society, Monthly Meeting
Ardmore, Oklahoma, January 16, 1975
KENNETH S. JOHNSON
Copper shales of southwestern Oklahoma

Panhandle Geological Society, Dinner Meeting
Amarillo, Texas, January 28, 1975
THOMAS W. AMSDEN
Porosity and permeability of Hunton strata, Anadarko basin

Oklahoma Heritage Institute, Weekly Meeting
Oklahoma City, Oklahoma, February 3, 1975
KENNETH S. JOHNSON
Geological history of Oklahoma

Oklahoma Department of Mental Health, Staff Meeting
Central State Griffin Memorial Hospital, Norman, Oklahoma, February 11, 1975
CHARLES J. MANKIN
Declining energy resources, a cause for concern

Oklahoma Gem and Mineral Society, Monthly Meeting
Oklahoma City, Oklahoma, February 20, 1975
CHARLES J. MANKIN
Oklahoma's energy industry—past, present, and future

The University of Oklahoma Engineers Club, Monthly Meeting
Norman, Oklahoma, March 27, 1975
KENNETH S. JOHNSON
Development of oil shale and other energy resources of the northern Colorado Plateau

Geography Department of Central State University, Workshop on "People Problems and Resource Conservation"
Edmond, Oklahoma, March 28, 1975
KENNETH S. JOHNSON
Mineral resources, mining activity, and reclamation practices in Oklahoma

American Association of Petroleum Geologists, Annual Meeting
Dallas, Texas, April 9, 1975
KENNETH S. JOHNSON
Stratigraphy of the Permian Blaine Formation and associated strata in north-central Texas

National Association of Geology Teachers (Oklahoma Section) and Oklahoma Science Teachers Association, Joint Spring Meeting
Roman Nose State Park, Watonga, Oklahoma, April 12, 1975
KENNETH S. JOHNSON
Programs and activities of the Oklahoma Geological Survey

League of Women Voters, Conference on "Energy, the Economy, and Citizen Values"
Norman, Oklahoma, June 25, 1975
KENNETH S. JOHNSON
Facts about energy: how can the citizen know?

Bachelor of Liberal Studies Program, Triannual Natural Science Seminar
Norman, Oklahoma, June 26, 1975
KENNETH S. JOHNSON
Mineral resources and environmental concern

U.S. Board on Geographic Names Decisions

The following Oklahoma place names have been approved by the U.S. Board on Geographic Names and published in the April through June 1975 issue of *Decisions on Geographic Names in the United States* (Decision List 7502).

Countyline (variant: County Line) has been adopted by the U.S. Board on Geographic Names to identify a village 6.4 kilometers (4 miles) northwest of Pruitt City, on the county line between Carter and Stephens Counties, Oklahoma (34°26′57″ N., 97°33′44″ W.).

Pruitt City (variant: Pruitt) has been adopted by the board to identify a community 6.4 kilometers (4 miles) southeast of Countyline, in Carter County, Oklahoma (34°25′12″ N., 97°30′35″ W.).

Rounds Creek (variants: Round Creek, Roundup Creek) has been adopted to identify a stream 12.9 kilometers (8 miles) long that heads at 34°43′30″ N., 97°39′32″ W., and flows northeast to join the Washita River 2.4 kilometers (1.5 miles) south of Lindsay, Garvin County, Oklahoma; sec. 15, T. 4 N., R. 4 W., Indian Meridian (34°48′58″ N., 97°36′53″ W.).

AIPG Names New State and National Officers

At its annual meeting at Arrowhead State Lodge in September, the Oklahoma Section of the American Institute of Professional Geologists installed new officers for the coming year. Named president was Ralph H. Espach, Jr., an Oklahoma City consulting geologist. Prior to establishing a consulting practice, Ralph worked with the California Company, Tenneco Oil Company, and Nichols Drilling Company.

Other new section officers are as follows: first vice-president and president-elect, William V. Knight, consultant, Tulsa; second vice-president, Henry Trattner, consultant, Oklahoma City; and secretary-treasurer, John S. Fryberger, Engineering Enterprises, Norman.

New Oklahoma Section district representatives are John H. Gatchell (Oklahoma City), Wilgus B. Creath (Tulsa), and Jerome M. Westheimer, of Ardmore, representative-at-large.

These officials, together with outgoing president Thomas L. Thompson, of Amoco Production Company, Tulsa, make up the state section's executive committee.

An important part of the meeting was the presentation of plaques, awarded for outstanding service to AIPG at the state and national level, to outgoing president Tommy Thompson and to past presidents Bob Hancock and Jerry Newby.

At the national AIPG meeting, in Tucson, Arizona, at the end of October, John A. Taylor, well-known Oklahoma City consulting and independent geologist, was introduced as the institute's new president-elect and advisory board chairman. Other national officers for the coming year are as follows: president, John D. Haun, Evergreen, Colorado; vice-president, Allen F. Agnew, Washington, D.C.; secretary-treasurer, John W. Shomaker, Albuquerque, New Mexico; and editor, Ross L. Shipman, Austin, Texas. Completing the national executive committee are the following representatives from the institute's advisory board: Jack O. Colle, Houston, Texas; J. W. Eggers, Baton Rouge, Louisiana; Wilson G. Harris, Jr., Mount Vernon, Illinois; and Michael R. Rector, Bakersfield, California.

New Theses Added to OU Geology Library

The following M.S. theses have been added to The University of Oklahoma Geology and Geophysics Library:

Geology of the Perma Area, Sanders County, Montana, by Joseph F. Meglen.

The Southern Oklahoma Aulacogen: A Geophysical and Geological Investigation, by Martin A. Pruatt.

Structural Analysis and Mapping of the Western Part of the Caddo Anticline, Carter County, Oklahoma, by Raphael L. Ghazal.

Growth of the OU Geology Library Mirrors That of Survey and School of Geology

Claren Kidd[1]

INTRODUCTION

The history of The University of Oklahoma Geology and Geophysics Library reflects the growth of the School of Geology and Geophysics and the Oklahoma Geological Survey as well as the library. The Survey has been on the OU campus since 1908 and has shared quarters adjacent to the geology department throughout most of its existence. In 1924, the Survey was placed under the direction and supervision of the University's Board of Regents, and provisions were made for its funds to be allocated directly from the Oklahoma Regents for Higher Education.

As the State Geological Survey, the OGS exchanges publications with all other state surveys or equivalent organizations. It also supports a widespread international exchange with geological surveys of other countries and with professional societies and academic institutions. The OGS purchases book and serial titles, library equipment and supplies, and often provides financial support for student library assistants. University Libraries processes materials for the Survey, but the publication-exchange program is maintained by the OGS.

The geology library, 1 of 9 branches in the OU library system, is in room 102 of Gould Hall (home of both the School of Geology and Geophysics and the Oklahoma Geological Survey). Materials acquired by either the University Libraries or the Survey are completely interfiled, shelved simply by call number.

Use of the library is open not only to students and faculty members of the University but also to interested users outside the University through interlibrary loan facilities of their company or their local library. Monographs or lengthy articles usually can be borrowed, or photoduplicated copies can be purchased. The library reserves the right to reject requests for loan of the actual publication in cases where the material is used extensively and must be kept available or when a publication is rare and replacement in case of accident would be almost impossible. In such instances, the material can be used on the library premises.

EARLY HISTORY OF THE LIBRARY

In 1899, the Department of Geology and Natural History and the Oklahoma Territory Department of Geology and Natural History were established. Dr. Charles A. Gould, who was the first geologist on the University faculty and is often called the "father of Oklahoma geology," brought his

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personal book collection—approximately 200 items—with him when he came to the 40-acre campus in 1900. In 1903, a fire consumed the University Building in which Dr. Gould had all of his scientific instruments, his notes, and the library. After the fire, the geology department moved to the top floor of what is now the Old Science Building, and there Dr. Gould began a new geological collection, consisting mostly of State and federal publications donated by the U.S. Geological Survey.

In 1908, Gould was named State Geologist for the Oklahoma Geological Survey, and he began a third library with materials received through Survey exchange programs. This library was first located in a rented room of a Norman residence and then was moved to the basement of the Carnegie Building, where it remained until 1917. In that year a geology building, now named Carpenter Hall, was constructed for the use of the geology department and the State Survey. The combined geological collections were located in the southwest corner of the new building: books were shelved in the storage room, the basement, and the reading room; the circulation desk and a small reading area were on the main floor.

The first librarian in charge of the geology collection was Bess J. Stewart, who was appointed in 1920. Following her were Dell P. Slaughter, Vera Griffen Willard, and Willie Sue Camuse. Theodore S. Bland was the librarian from 1930 until 1938. Under his supervision, the collection of books became a library. In his annual reports, he listed serials for which he created analytical cards, the titles of new books, lists of materials which were lost, and circulation statistics. (During his stay at OU, the National Youth Administration, one of the work programs created during the depression, supported several student library assistants in addition to the 2 or 3 that the University employed.) When Bland left OU in 1938 to accept a position with the University of Iowa, Alan G. Skelton, from The University of Texas, became librarian.

During this period, money was allocated through the University library system to academic departments. They, in turn, could spend the allocation for laboratory facilities or for library acquisitions. From 1927, when the geology department became the School of Geology, until 1940, book purchases for the geology library ranged from a high of $1,500 in 1929-30 to a low of $625 in 1933-34.

The Geological Library, as it was then called, contained approximately 35,000 volumes, plus a collection of 10,000 maps and 95,000 drillers' logs. Three WPA projects of the early 1940's supplied approximately a dozen full-time employees, ranging in age from 20 to 70, for work in the library. The first project called for checking, refiling, and replacing missing sheets from the two sets of drillers' logs. Because of crowded conditions in the geology building, this work was accomplished in a room under the stadium. The other two projects were to acquire a complete set of USGS topographic sheets and to organize and acquire a variety of other maps.

As another project, Alan Skelton perceived a demand for materials on Oklahoma oil and gas pools and compiled *A Bibliography of Oklahoma Oil and Gas Pools,* which was published by the Survey as Bulletin 63. This effort

Throughout the years, one of the geology librarian's most rewarding duties has been helping students obtain scientific information. The photo at left, taken in June 1938, shows library assistant Martha Butcher (who later married Alan Skelton, OU geology librarian, 1938-44) aiding a graduate student, while the right-hand photo, taken November 1975, shows student library assistant Ken Pearson checking out a book for a student as Claren Kidd, librarian, supervises.

resulted in a close relationship between Alan and members of the Nomenclature Committee of the Mid-Continent Oil and Gas Association in Tulsa, and in 1944 he resigned his OU position and joined the Tulsa association.

THE "FINNERTY ERA"

In 1944, Lucy H. Finnerty became librarian for the geology library. She had worked in the OU library as a student assistant in 1924-26 and in the circulation department in 1926-29. Subsequent to a year's leave of absence to earn the library-science degree, she returned to Bizzell Library in 1930-32 and again in 1940-43. Dr. V. E. Monnett, director of the School of Geology from 1924 until 1955, was skeptical about having a woman librarian; nevertheless, owing to the scarcity of male librarians during war years, Lucy got the job. After "proving her competence," Dr. Monnett praised her for her "courteous service, complete records, and helpful assistance to students and faculty."

Following World War II, veterans eagerly sought higher education. The largest known enrollment of geology majors occurred in 1948, with 689 undergraduates and 69 graduate students. The library was strained to serve this large number. There were shortages of assistants and seating space, some shelving was hazardous because of its height and the narrow aisle width, and book funds were insufficient. In May 1951, the long-anticipated move to new quarters in Gould Hall began. At last space was adequate, but funds did not permit the purchase of new uprights or shelving; therefore, extensions were welded to uprights salvaged from the old library. New

shelving was used only on the main floor. Box by box, the library's 24,041 accessioned volumes were moved as shelving was completed. Another problem was that the Survey did not move into its wing until 1952, and a messenger service was created to maintain communications between the two buildings.

In the meantime, as the faculty increased, programs expanded, and the number of graduate students grew, an urgent need was felt for more research materials, especially foreign literature, serials, and field guidebooks. In 1950 the $3,500 book budget was largely devoted to the development of a collection of geological and paleontological materials. In 1951, geophysics was added to the School's curriculum, and acquisitions began in that area. As for acquiring foreign literature, the late Carl Branson was a tremendous asset in that endeavor (see memorial, p. 224). Even after he ended his tenure as chairman of the library committee and became director of the Survey, he continued to search the literature for significant contributions to the library collections. Most notable were his endeavors in the acquisition of East European and Slavic materials and in the establishment of new exchange programs. In 1954, an especially important addition to the collection was made—a microfilm of volumes 1-8 of Joachim Barrande's *Le Systême Silurian du Centre de la Bohême.*

Lucy Finnerty left the geology library in 1956 to enter private business, and Jack W. Dickey was appointed librarian in June. Notable acquisitions that year included *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen,* volumes 92-103; Societé Géologique de France, *Mémoires,* series 1, volumes 1-5; and *Geologisches Zentralblatt,* volumes 3-20.

The emphasis of the school began to shift as the faculty changed; titles in structural geology, palynology, and earth-science education were added to the library's holdings. In 1959 the collection of the late Charles E. Decker, the School's research professor emeritus and former "Custodian" of the Geological Survey, was added to the library. Other important acquisitions included early runs of German, Austrian, and Russian journals, plus many volumes added through the Farmington Plan. This plan, named for the Connecticut town where the participants' first organizational meeting was held, assured that a research library in the United States would obtain one copy of every scholarly book published in Europe. Assignments were made by subject on either a primary or a secondary basis. Under the secondary-membership plan, our geology library was notified of all publications within its scope of interests, with an option rather than an obligation to purchase.

Lucy Finnerty returned to the library as geology librarian in August 1960, where she stayed until her retirement in the spring of 1971. A former student assistant, Carolyn Powell, returned to the library as library assistant (a full-time, classified position created in 1954) that winter and has remained with us. When Lucy returned, the library collection contained 60,481 catalogued volumes, 24,209 maps, 70,000 scout tickets, and 3 sets of Oklahoma Corporation Commission drillers' logs that totaled 763,188 sheets. Eleven volumes of *Palaeontographica. Abt. B.,* numerous French

translations of Russian journals, plus miscellaneous items, and approximately $3,000 worth of materials were acquired through the Survey's exchange program. In addition, the Survey had subscribed to *Petroleum Abstracts,* a dozen Russian journals, and four serials that were duplicate titles. By 1965, the cataloged collection numbered 67,861 volumes, and in 1970 the cataloged volumes had grown to 75,183. The Farmington Plan, Research Fund, Research Institute Fund, gifts, Survey support, and an increase in the geology book fund all contributed to the library's development. A few examples of the variety of ways in which people and organizations helped out will illustrate the importance of this assistance. Prior to a trip to the U.S.S.R., Dr. Maxim Elias, adjunct professor of geology, was given a list of serials needed by the library, and he obtained some and made the contacts necessary for acquiring many others; Sohio Petroleum Company's Oklahoma City office donated a microform reader and a microform collection on the geology of the Rocky Mountain area; and the Survey added microfilm copies of volumes 1-12 of the *Oil and Gas Journal.*

Improvements in the library's physical facilities were also necessary to accommodate the growth in materials. The library expanded into former classrooms, which were renovated with better lighting, more seating, journal display cases, reference shelving, and a new circulation desk. Cabinetry was purchased by the Survey to house the map collection, and in 1970 the maps were moved from the basement into Room 103; new lighting was installed, and an entrance was created into the reading room.

The size and scope of the map collection received more emphasis during the 1960's and 1970's than at any other time. Geological and geophysical maps from all parts of the world were sought and acquired, and correlation charts and cross sections that were not parts of a publication were purchased and added to the collection in the map room.

Much of the credit for the growth and the quality of the geology library goes to Lucy Finnerty, for she had a profound influence on its development in the 23 years that she served as librarian.

After Lucy's retirement in 1971, Katherine Keener was appointed geology librarian, a position she held until July 1973, when she moved to Reston, Virginia, to accept a position with the U.S. Geological Survey Library. During her short stay at OU, she authored a cumulative, alphabetically arranged author list of all geology and geological engineering theses completed at OU and indexed it by study locality and student's year of graduation. During this same period, valuable collections that belonged to Dr. William E. Ham, Dr. V. E. Monnett, and Norman W. Brillhart were donated. Office collections of Survey professional staff members, faculty of the School of Geology and Geophysics, and alumni have been given to the geology library and have added tremendously to its value, but these collections were especially significant.

With Katherine Keener's resignation, this author transferred from the position of assistant information services librarian in Bizzell Memorial Library to accept the position of librarian in the Geology and Geophysics Library.

PRESENT CONDITION OF THE LIBRARY

Today the closed-stack collection of the geology library contains approximately 84,000 cataloged volumes, 56,000 maps, 107,000 scout tickets, and 930,000 drillers' logs. Approximately 800 serial titles are received by the library (and of these almost three-fourths are the result of exchange agreements established and maintained by the Survey or the School). The geology library is a depository for all USGS topographic sheets (scales of 1:24,000, 1:62,500, and 1:250,000) and USGS maps of hydrologic units, river surveys, national parks, geologic quadrangles, geophysical investigations, coal investigations, oil and gas investigations, and hydrologic atlases. State and foreign geological surveys also compile and publish maps that are part of the map collection.

A card catalog has been developed to give access to maps prepared in series by the USGS and by individual states, for individually issued maps, and for USGS topographic sheets for Oklahoma, Kansas, Texas, New Mexico, Arkansas, Louisiana, and Virginia. Access to all maps is by nation, state or province, and county or parish. For the topographic sheets of the states mentioned above, area access is by latitude, longitude, and state subdivided by county and quadrangle.

In short, The University of Oklahoma has one of the largest and finest university geological libraries in the United States. Its areas of greatest strength are the geology and paleontology of the European nations, the U.S.S.R., Australia, Canada, and the United States. The School of Geology and Geophysics has paid wages for student assistants and has occasionally financed rentals and the purchase of supplies. The OU library system has

Doug Bellis, student library assistant, scans a current periodical before placing it on display shelf behind him for use in the library's reading room.

The OU Geology and Geophysics Library is open to students, staff, faculty, and the general public, and library officials schedule periodic sessions to help newcomers familiarize themselves with the facilities.

provided funds for the geology library as well as for the technical processing of materials. The Oklahoma Geological Survey has expended between $1,000 and $2,000 per year since the late 1950's for library purchases, has arranged new exchanges, maintained existing exchange programs, paid wages for student assistants, and purchased needed equipment. Many states have separate, almost duplicate, libraries for their university and their state survey, but in Oklahoma the citizens of the State benefit from the existence of one large, integrated collection.

Not content to accept the present condition of the library as the best it can be, several projects that are expected to improve it are under way. During the spring semester of the 1975-76 academic year, the library staff will conclude a complete inventory of all printed materials: numerous duplicate materials will be sold or exchanged for items that are needed to fill in gaps in the collection, and it is hoped that a unified, comprehensive University map collection will be established adjacent to the geology library.

New projects will continue to be undertaken, and suggestions for improvements are always welcome. Send them to the library staff, the Survey staff, or the faculty of the School; they all have a vested interest in the quality of the geology library, as does everyone else who uses it.

ACKNOWLEDGMENTS

Without the personal correspondence with Alan Skelton, technical information officer for the Department of the Army, Vicksburg, Mississippi, and numerous conferences with Lucy Finnerty, this effort would have been incomplete. Appreciation is also extended to Betty Ham, C. A. Merritt, Cecil Lalicker, Malcolm Oakes, Maud Salyer, Mildred Reeds, John Roberts, and the late Carl Branson for their interesting and useful comments.

Carl Colton Branson
1906-1975

Although professionally a geologist, Dr. Carl Colton Branson was a scholar of wide interests, who had a remarkable depth of knowledge in an amazing number of fields. His passing is a great loss to those of kindred interests and others who shared his life. He was at his best in the field, especially at the end of a difficult and exhausting day, when the observations were being recounted and put in order. At these times he would often digress and quote a limerick or reflect on what his favorite authors or scientific contemporaries might have offered on the subject. He was always a generous and considerate critic of differing opinions. He was a teacher who guided his students in a manner that created in them the desire to lead the way. He produced many competent and successful scientists by his pedagogy, and in his modest way, he was exceedingly proud of them.

Carl's father was Dr. E. B. Branson, former head of the Geology Department at the University of Missouri, who is well known for his teaching and research in paleontology. Carl was born in Oberlin, Ohio, on September 15, 1906, grew up in Missouri, and attended the University of Missouri, where he received his Bachelor of Arts degree in 1926 and his Master of Arts degree in 1927. His Ph.D. degree was taken at the University of Chicago in 1929 at the age of 22. He was elected to Phi Beta Kappa in 1926, and he maintained contact with that society throughout his career; in 1964-65, he was president of Alpha Chapter of Oklahoma at The University of Oklahoma.

A recounting of Carl Branson's career unfolds a prime example of professional growth by a person much alive to scientific endeavor and its re-

sponsibilities. He began a teaching career in 1929 as an instructor in paleontology at the State College of Washington, then moved to Brown University in 1930 for a period of 10 years. In 1940 he accepted a visiting assistant professorship in geology at Northwestern University and in 1941, moved to the University of Kentucky, where he was an associate professor of geology. In 1944, he left the academic world to become a research geologist for Shell Oil Company, but he returned to teaching in 1950 as a professor of geology at The University of Oklahoma. His professional development was rapid, for he became director of The University of Oklahoma School of Geology and also director of the Oklahoma Geological Survey in 1954. He held the former position until 1963 and the latter until 1967. In 1967, he assumed the position of research geologist with the Oklahoma Geological Survey, meanwhile retaining his professorship in the School until 1972, when he became an emeritus professor of geology and geophysics.

An active career requires many affiliations with local, national, and international organizations. Carl Branson was much a part of these and held many responsible positions in their ranks. In The American Association of Petroleum Geologists, he was district representative from 1956 to 1958; served on the editorial board; was a Distinguished Lecturer in 1962-63; contributed to and edited the landmark volume, *Pennsylvanian System in the United States—a Symposium* (1962); and was elected to honorary membership in 1973. He was affiliated with many other organizations, among which are the following: The Geological Society of America, Paleontological Society of America, Society of Economic Paleontologists and Mineralogists, Society of Vertebrate Paleontologists, Paleontology Society of India, Paleontology Research Institute, American Association for the Advancement of Science, Association of American State Geologists (president 1962-63), American Institute of Mining, Metallurgical, and Petroleum Engineers, Oklahoma City Geological Society (honorary member, 1964), Tulsa Geological Society, Ardmore Geological Society, Oklahoma Academy of Science, Sigma Xi, Gamma Alpha, and Sigma Gamma Epsilon.

Research, literature review, writing, and editing, as well as teaching, were a major portion of Carl Branson's life. His publication list begins with *Paleontology and Stratigraphy of the Phosphoria Formation,* a 99-page document that appeared in 1930, and he continued to publish until 1972. During that interval, 204 papers appeared under his name, either as sole author or as a coauthor. He also contributed to the organization and content of scores of other works by various authors. Although the greatest number of his publications (93) dealt with aspects of paleontology, his other contributions were varied. It is difficult to categorize them because of their breadth, but an attempt is as follows: stratigraphy, 44, general geology, 24, memorials, 20, reviews, 12, economic geology, 7, and mapping, 4. Among the most frequently cited publications of Carl Branson are his conodont studies, *Bibliographic Index of Permian Invertebrates* (1948, GSA Memoir 26, 1049 pages) and his papers on Pennsylvanian stratigraphy.

In 1948 Carl Branson married Ila Irene Freeman, who was then a

geologist with the U.S. Geological Survey. After their marriage, Ila Branson resigned from the geological profession and confined her activity to raising a family of two sons, Derick and David, and a daughter, Deborah. All three are presently attending The University of Oklahoma.

Carl suffered a stroke in April 1969, which left him partially paralyzed, and he was largely confined to his home. However, he maintained an active interest in geology until his death on August 27, 1975. It was always a great pleasure to visit with him and talk at length about his many interests, especially about stratigraphic paleontology. His influence will remain a part of Oklahoma's geological heritage, and his friends will remember him as a scientist who had a passion for accuracy and understanding.

—L. R. Wilson

Statistics of Oklahoma's Petroleum Industry, 1974

John F. Roberts

Increased incentives—higher prices for both oil and gas—resulted in 3,057 wells drilled in search of oil and gas, the most drilled since 1969 (table 1, fig. 1). Development-well completions as producers for both oil and gas were 31 percent higher than during 1973. Exploration drilling accounted for 396 wells, 12.5 percent more than the previous year. The success ratio was 28:1. As it was last year, Woodward County was the site of the largest exploration activity (fig. 2). There were 21 tries, 5 of which were successful gas completions. As usual, Osage County had the most total wells, 358, and Kingfisher County was second with 169 wells. The statewide success ratio for development wells was 64 percent; exploratory wells, 28 percent.

Exploration drilling led to discovery of many new fields within the State. The most important discoveries were gas producers on the north flank of the Anadarko basin, extending from central Oklahoma westward to the Texas border. The producing horizons were concentrated in the Hunton, Springer, and Morrow formations. Other portions of the State accounted for discoveries in Pennsylvanian sands as well as the deeper and older formations men-

[1]Geologist, Oklahoma Geological Survey.

TABLE 1.—DRILLING ACTIVITY IN OKLAHOMA, 1974

	1974				1973
All wells	CRUDE	GAS	DRY	TOTAL	TOTAL
Number of completions	1,149	744	1,164	3,057	2,281
Footage				17,046,378	12,434,227
Average footage				5,345	5,451
Exploration wells					
Number of completions	51	61	284	396	352
Percentage of completions				28	30
Footage				2,674,764	2,279,089
Average footage				6,754	6,475
Development wells					
Number of completions	1,098	683	880	2,661	1,929
Percentage of completions				67	69
Footage				14,371,614	10,155,138
Average footage				5,146	5,264

Note: Footages include service wells

Source: *Oil and Gas Journal*, v. 73, no. 18, May 5, 1975.

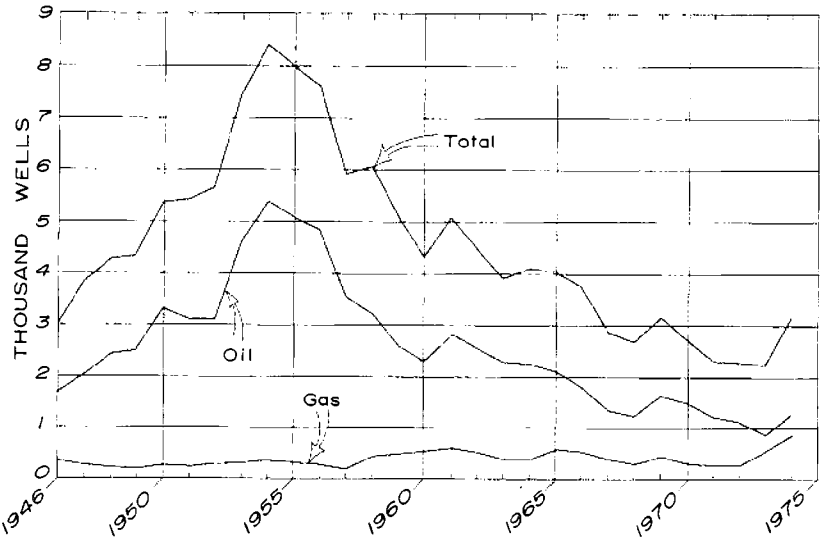

Figure 1. Graph showing total wells drilled, oil wells completed, and gas wells completed in Oklahoma, 1946-74. Source: *Oil and Gas Journal.*

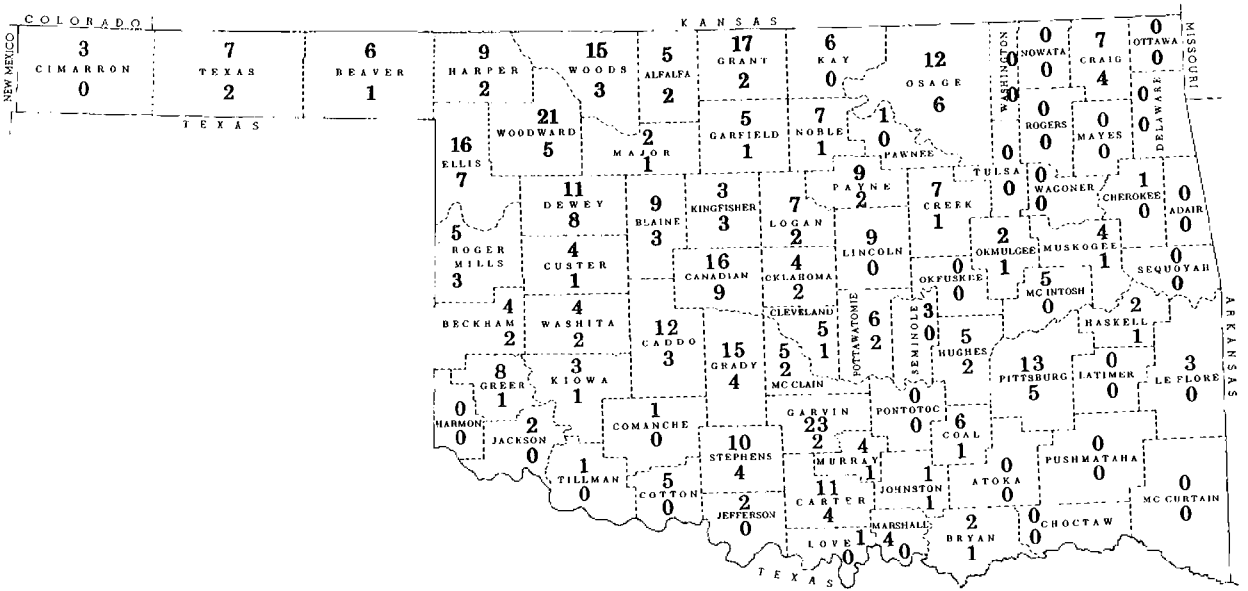

Figure 2. Exploratory drilling by counties during 1974. Upper figures give number of exploratory wells drilled; lower figures give number of successful completions. Source: American Petroleum Institute in cooperation with U.S. Bureau of Mines.

tioned above. The Arkoma basin in east-central Oklahoma was the site of gas discoveries in Pittsburg and Sequoyah Counties.

A significant discovery may be the Helmerich & Payne 1 Cupp in sec. 27, T. 10 N., R. 26 W., Beckham County. The well was completed in the Arbuckle Group (Upper Cambrian and Lower Ordovician) from perforations in the interval 16,850 to 17,476 feet, for a calculated open-flow potential of 32 million cubic feet of gas per day. The nearest Arbuckle production is in the Gageby Creek field, 35 miles west northwest, in Wheeler County, Texas. In Oklahoma, the nearest Arbuckle producer is a well in the South Apache field (northern Comanche County) that has produced a sizable volume of gas.

Oklahoma now has the two deepest wells and the single deepest producer in the world. The Lone Star Producing Company, 1 Bertha Rogers Unit in sec. 27, T. 10 N., R. 19 W., Washita County, reached a total depth of 31,441 feet in dolomite of the Arbuckle Group (Ordovician). At this depth molten sulfur entered the drill stem and recrystalized, causing the bottom part of the well to be lost. The well was then completed as a shut-in gas well from perforations from 13,000 to 13,110 feet in granite wash of Pennsylvanian age. In 1972, Lone Star had completed the 1 E. R. Baden Unit in sec. 28, T. 10 N., R. 22 W., Beckham County, 19 miles west of the 1 Rogers, in Viola Limestone(?), Ordovician, at a total depth of 30,050 feet. The Baden well held the world depth record for 2 years. The Union Oil Co. of California 1 Annie Bruner in Beckham County remains the deepest producer in the world, producing from the Hunton Group (Devonian and Silurian) at a depth of 24,548 feet.

National Stripper Well Survey, January 1, 1975, a joint project of the Interstate Oil Compact Commission and the National Stripper Well Association, indicates that at the close of 1974, Oklahoma had 59,817 stripper wells, a 4.9 percent increase over the 1973 figure. The increase in the number of stripper wells is due to the price increase in crude oil, which enables a well to produce a smaller amount of crude oil per day and still remain economic. A stripper well, for the purpose of this survey, is a well producing 10 barrels of oil per day or less during the year under consideration. In Oklahoma, stripper wells produced 73,695,000 barrels of oil—42.6 percent of the State's total crude-oil production. This is less than the 1973 production of 74,110,000 barrels but a larger percentage of the State's total, owing to a marked decline in the State's total production. The decline in production would have been considerably greater under adverse economic conditions.

Table 1 summarizes drilling activity during 1974 and compares it with that of the previous year. The average total depth of all wells decreased slightly from the previous year; 5,451 feet in 1973 to 5,345 feet in 1974. The average total depth of exploratory wells increased slightly, while that of development wells decreased by a small amount.

The 22 giant fields of Oklahoma are listed in table 2. (A giant field is one that has an estimated ultimate recovery of more than 100 million barrels of oil.) These giant fields produced 48 percent of the year's total liquid hydrocarbon production from 36 percent of the State's producing wells. They account for 46 percent of the remaining recoverable reserves in the State.

Table 3 lists cumulative and yearly production and the value of all petroleum products to January 1, 1975. Table 4 compares the petroleum production of the last 2 years. Crude-oil production declined, even though the number of completed oil wells during the year increased, because the maturity of numerous wells resulted in their abandonment. Natural-gas production increased slightly, owing to the completion of an increased number of wells.

TABLE 2.—GIANT OIL FIELDS OF OKLAHOMA, 1974

FIELD	1974 PRODUCTION (1000 BBLS)	CUMULATIVE PRODUCTION (1000 BBLS)	ESTIMATED RESERVES (1000 BBLS)	NUMBER OF WELLS
Allen	2,540	126,921	13,079	1,500
Avant	360	106,602	2,398	645
Bowlegs	1,665	158,492	6,508	175
Burbank	3,685	504,039	36,961	1,070
Cement	1,280	140,236	14,764	1,465
Cushing	2,965	463,182	21,818	1,700
Earlsboro	620	216,424	3,576	200
Edmond West	625	155,147	4,853	450
Eola-Robberson	3,720	107,977	32,023	485
Fitts	2,565	150,873	12,127	635
Glenn Pool	1,980	309,421	10,579	1,035
Golden Trend	8,135	402,011	97,989	1,200
Healdton	7,575	294,240	25,760	1,460
Hewitt	6,595	218,986	31,014	1,180
Little River	330	159,901	5,099	165
Oklahoma City	2,000	733,896	16,104	265
Postle	6,780	70,560	60,102	285
Seminole, Greater	1,010	199,456	10,544	255
Sho-Vel-Tum	34,250	1,002,456	247,544	8,040
Sooner Trend	9,810	199,414	50,586	2,975
St. Louis	1,100	216,145	8,855	610
Tonkawa	275	135,212	1,788	205
Totals	99,865	6,071,591	714,071	26,000

Source: *Oil and Gas Journal*, v. 73, no. 4, January 27, 1975.

TABLE 3.—CUMULATIVE (THROUGH 1955) AND YEARLY (1956-1974) MARKETED PRODUCTION AND VALUE OF PETROLEUM, NATURAL GAS, NATURAL GASOLINE, AND LIQUEFIED PETROLEUM GAS IN OKLAHOMA[1]

YEAR	CRUDE PETROLEUM		NATURAL GAS		NATURAL GASOLINE AND CYCLE PRODUCTS		LIQUEFIED PETROLEUM GAS	
	VOLUME (1,000 BBLS)	VALUE ($1,000)	VOLUME (MMCF)	VALUE ($1,000)	VOLUME (1,000 GALS)	VALUE ($1,000)	VOLUME (1,000 GALS)	VALUE ($1,000)
Through 1955	7,230,010	11,443,269	12,977,332	1,378,370	14,420,482	890,729	3,673,364	120,097
1956	215,862	600,096	678,603	54,288	489,963	26,543	579,101	23,427
1957	214,661	650,423	719,794	59,743	460,644	25,329	587,140	21,824
1958	200,699	594,069	696,504	70,347	440,798	26,029	657,114	25,822
1959	198,090	578,423	811,508	81,151	448,353	29,443	675,869	27,070
1960	192,913	563,306	824,266	98,088	531,995	33,074	762,258	32,409
1961	193,081	561,866	892,697	108,016	521,237	33,358	817,082	30,141
1962	202,732	591,977	1,060,717	135,772	552,795	35,764	838,903	25,223
1963	201,962	587,709	1,233,883	160,405	555,467	35,131	810,894	28,981
1964	202,524	587,320	1,323,390	166,747	554,053	34,011	880,804	28,055
1965	203,441	587,944	1,320,995	182,297	570,129	34,561	894,665	32,208
1966	224,839	654,281	1,351,225	189,172	576,124	35,715	968,254	44,381
1967	230,749	676,095	1,412,952	202,052	568,905	35,846	1,005,633	49,276
1968	223,623	668,202	1,390,884	197,506	584,010	38,829	1,070,874	39,520
1969	224,729	701,155	1,523,715	223,128	614,082	38,931	1,146,768	34,403
1970	223,574	712,419	1,594,943	248,811	622,146	39,933	1,177,218	52,975
1971	213,312	725,610	1,684,260	273,945	595,854	40,856	1,156,680	56,732
1972	207,633	709,033	1,806,887	294,523	611,478	42,709	1,140,216	57,101
1973	191,204	723,273	1,770,980	334,110	616,308	49,070	1,219,848	95,264
1974	179,580	1,300,159	1,785,682	426,778	579,768	91,935	1,301,370	203,262
Totals	11,179,024	24,276,312	36,862,509	4,885,249	24,914,591	1,617,796	21,364,055	1,028,171

Figures from: *Minerals Yearbook* of the U.S. Bureau of Mines. Totals for crude petroleum differ from those compiled by the U.S. Bureau of Mines and the American Petroleum Institute principally because of the exclusion from USBM and API compilations of an estimated production of 26,355,000 barrels for the years 1905-1906. the years 1905-1906.

[1]Preliminary figures for 1974.

Figure 3 shows a decrease in natural-gas reserves from 14.1 trillion cubic feet to 13.4 trillion cubic feet, because more natural gas was produced than was added to reserves by discoveries and revisions. The ratio of remaining reserves to production remained at 7.9.

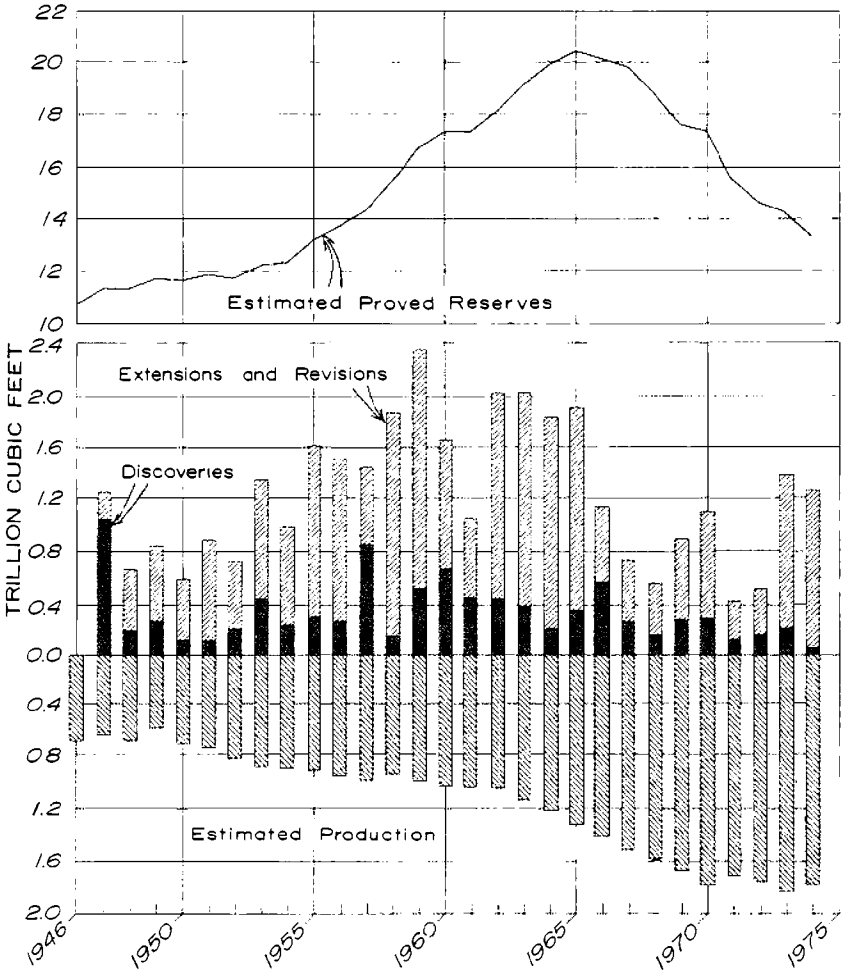

Figure 3. Graph showing statistics on estimated proved reserves of natural gas in Oklahoma, 1946-74. Source: American Gas Association, annual reports.

Figure 4 displays an increase in discoveries and extensions of total liquid hydrocarbons. The decrease in production from 220 million barrels in 1973 to 207 million barrels in 1974 accounts for a decline of remaining reserves to 1,523 million barrels, a ratio of 7.3.

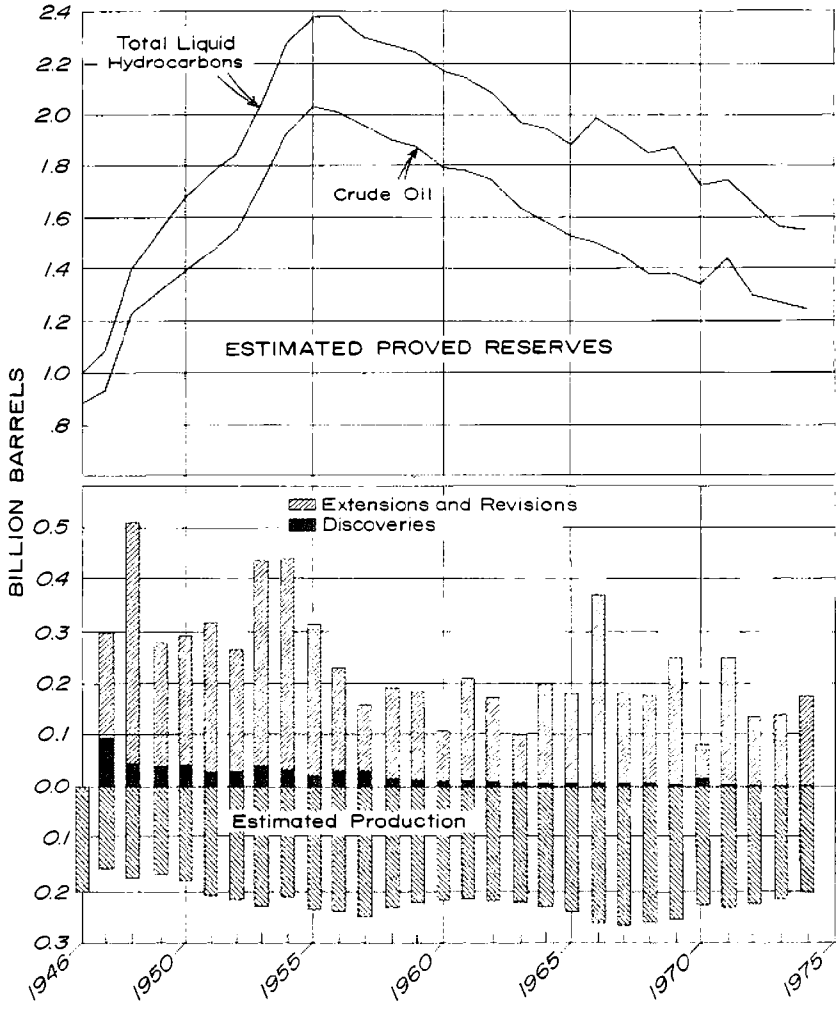

Figure 4. Graph showing statistics on estimated proved reserves of total liquid hydrocarbons in Oklahoma, 1946-74. Source: American Petroleum Institute, annual reports.

Oklahoma continues to rank third in the nation in natural-gas production (with 8 percent of the total U.S. production) and fourth in liquid-hydrocarbon production (5.5 percent of the total). The State ranks fourth in the nation in natural-gas reserves and fifth in oil reserves.

TABLE 4.—HYDROCARBON PRODUCTION IN OKLAHOMA

	1973	1974
Crude oil and lease condensate		
Total annual production (1,000 bbls)[1]	191,204	179,580
Value ($1,000)[1]	723,273	1,300,159
Cumulative production 1891-year (1,000 bbls)	10,995,638	11,179,024
Daily production (bbls)	523,847	492,000
Total number of producing wells[2]	73,025	71,848
Daily average per well (bbls)	7.2	6.7
Oil wells on artificial lift (estimated)[2]	69,082	67,962
Natural gas		
Total annual marketed production (MMCF)[1]	1,770,980	1,785,682
Value ($1,000)[1]	334,110	426,778
Total number of gas and gas-condensate wells[2]	8,453	9,367
Natural-gas liquids		
Total annual marketed production (1,000 bbls)[1]	43,718	44,789
Value ($1,000)[1]	144,334	295,197

[1]Item for 1973 is U.S. Bureau of Mines final figure. Item for 1974 is U.S. Bureau of Mines preliminary figure.
[2]*World Oil,* annual forecast and review issue, v. 178, no. 3, February 15, 1975.

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