FOREWORD

This collection of 60 short papers on subjects in the fields of geology, hydrology, topography, and related sciences is the third of a series to be released during the year as chapters of Professional Paper 450. The papers in this chapter report on the scientific and economic results of current work by members of the Geologic, Water Resources, and Topographic Divisions of the United States Geological Survey. Some of the papers announce new discoveries or present observations on problems of limited scope; other papers draw conclusions from more extensive or continuing investigations that in large part will be discussed in greater detail in reports to be published in the future.

Chapter A of this series, to be published later in the year, will present a synopsis of results from a wide range of work done during the present fiscal year.

THOMAS B. NOLAN,
Director.
CONTENTS

Economic geology

120. Age of some copper-bearing porphyries and other igneous rocks in southeastern Arizona, by S. C. Creasey and R. W. Kister ................................................................. D1
121. Thalenite from Teller County, Colorado, by J. W. Adams, F. A. Hildebrand, and R. G. Havens ................................................................. 6
122. Alteration as a guide to uranium ore, Shirley Basin, Wyoming, by E. N. Harshman ................................................................. 8
123. Alunite on Aspen Mountain, southwestern Wyoming, by J. D. Love and P. D. Blackmon ................................................................. 11
124. Clays in the Morrison Formation and their spatial relation to the uranium deposits at Ambrosia Lake, New Mexico, by H. C. Granger ................................................................. 15

Engineering geology

125. Geology of Djatiluhur damsite and vicinity, West Java, Indonesia, by H. H. Waldron ................................................................. 21

Stratigraphy

126. Precambrian(?) and Cambrian stratigraphy in Esmeralda County, Nevada, by J. P. Albers and J. H. Stewart ................................................................. 24
127. Cambrian Carrara Formation, Bonanza King Formation, and Dunderberg Shale east of Yucca Flat, Nye County, Nevada, by Harley Barnes, R. L. Christiansen, and F. M. Byers, Jr ................................................................. 27
128. Age and sequence of metasedimentary and metavolcanic formations northwest of New Haven, Connecticut, by C. E. Fritts ................................................................. 32
130. Type sections for the Morrow Series, of Pennsylvanian age, and adjacent beds, Washington County, Arkansas, by L. G. Henbest ................................................................. 38
131. New members of the Floyd Formation of Pennsylvanian age, Washington County, Arkansas, by L. G. Henbest ................................................................. 42
132. The Eagle Valley Evaporite and its relation to the Minturn and Maroon Formations, northwest Colorado, by T. S. Lovering and W. W. Mallory ................................................................. 45
133. Jurassic stratigraphy in the McCarthy C-5 quadrangle, Alaska, by E. M. MacKevett, Jr., and R. W. Inlay ................................................................. 49
134. Some Late Cretaceous strand lines in southern Wyoming, by A. D. Zapp and W. A. Cobban ................................................................. 52
135. Tertiary volcanic and related rocks of the Republic area, Ferry County, Washington, by Siegfried Muessig ................................................................. 56
136. Geology of Tertiary rocks in Escambia and Santa Rosa Counties, western Florida, by O. T. Marsh ................................................................. 59
137. Stratigraphy and hydrology of the Juana Diaz Formation in the Yauco area, Puerto Rico, by I. G. Grossman ................................................................. 62
138. Pyroclastic deposits of Recent age at Mount Rainier, Washington, by D. R. Crandell, D. R. Mullineaux, R. D. Miller, and Meyer Rubin ................................................................. 64

Structural geology

139. The Pine Mountain overthrust at the northeast end of the Powell Valley anticline, Virginia, by R. L. Miller ................................................................. 69
140. Gravity and magnetic anomalies in Gem Valley, Caribou County, Idaho, by D. R. Mabey and F. C. Armstrong ................................................................. 73
141. Gravity, volcanism, and crustal deformation in the eastern Snake River Plain, Idaho, by T. R. LaFehr and L. C. Pakiser ................................................................. 76
142. Geohydrologic evidence of a buried fault in the Erda area, Tooele Valley, Utah, by J. S. Gates ................................................................. 78
143. Recurrent movement on the Canyon Creek fault, Navajo County, Arizona, by T. L. Finnell ................................................................. 80
144. Restudy of the Arrowhead fault, Muddy Mountains, Nevada, by C. R. Longwell ................................................................. 82
145. Correlation of granite plutons across faulted Owens Valley, California, by D. C. Ross ................................................................. 86
146. Structural control of interior drainage, southern San Joaquin Valley, California, by G. H. Davis and J. H. Green ................................................................. 89
147. Tertiary salt domes near San Pedro de Atacama, Chile, by R. J. Dingman ................................................................. 92
148. Zinc occurrence in the Serpent Mound structure of southern Ohio, by A. V. Heyl and M. R. Brock ................................................................. 95

Geophysics

150. Electrical and magnetic properties of a replacement-type magnetite deposit in San Bernardino County, California, by C. J. Zablocki ................................................................. 103
151. Determination of the magnetic polarity of rock samples in the field, by R. R. Doell and Allan Cox ................................................................. 105
Mineralogy, geochemistry, and petrology
152. Thermal expansion of ten minerals, by B. J. Skinner ........................................ 122
153. Hydrothermal alteration in drill holes GS-5 and GS-7, Steamboat Springs, Nevada, by G. E. Sigvaldason and D. E. White .......................................................... 113

Geomorphology and glacial geology
155. Erosional features of snow avalanches, Middle Fork Kings River, California, by G. H. Davis .............................................................................................. 122
156. Configuration of the bedrock beneath the channel of the lower Merrimack River, Massachusetts, by E. A. Sammel .......................................................... 125
157. Geology of Pleistocene deposits of Lake County, Indiana, by J. S. Rosenheim .............................................................................................. 127
158. Geology of the Vermilion end moraine, Nett Lake Indian Reservation, Minnesota, by R. F. Norvitch .......................................................... 130
159. Three pre-Bull Lake tills in the Wind River Mountains, Wyoming, by G. M. Richmond .............................................................................................. 132
160. Faulted Pleistocene strata near Jackson, northwestern Wyoming, by J. D. Love and D. W. Taylor .............................................................................................. 136

Paleontology and paleoecology
161. Late Cretaceous Desmoscaphites Range Zone in the western interior region, by W. A. Cobban .............................................................................................. 140
162. The ostracode genus Cytherelloidea, a possible indicator of paleotemperature, by I. G. Sohn .............................................................................................. 144

Sedimentation
163. Wind directions in late Paleozoic to middle Mesozoic time on the Colorado Plateau, by F. G. Poole .............................................................................................. 147
164. Laboratory studies on deformation in unconsolidated sediment, by E. D. McKee, M. A. Reynolds, and C. H. Baker, Jr .............................................................................................. 151

Illustrative and mapping techniques
166. Edge isolation in photogrammetry and geologic photography, by A. B. Clarke .............................................................................................. 160
167. Shortcut method for the preparation of shaded-relief illustrations, by J. R. Stacy .............................................................................................. 165

HYDROLOGIC STUDIES

Ground water
168. Winter ground-water temperatures along the Mullica River, Wharton Tract, New Jersey, by E. C. Rhodehamel and S. M. Lang .............................................................................................. 165
169. Relation of permeability and jointing in crystalline metamorphic rocks near Jonesboro, Georgia, by J. W. Stewart .............................................................................................. 168
170. Aquifers in buried shore and glaciofluvial deposits along the Gladstone beach of glacial Lake Agassiz near Stephen, Minnesota, by R. W. Maclay and G. R. Schiner .............................................................................................. 170
171. Potential yield of deep water wells in the southern part of the Jicarilla Apache Indian Reservation and vicinity, San Juan Basin, New Mexico, by E. H. Baltz, S. W. West, and S. R. Ash .............................................................................................. 173
172. Compaction of the aquifer system and land subsidence in the Santa Clara Valley, California, by J. H. Green .............................................................................................. 175

Surface water
173. Use of short records of runoff to estimate a 25-year average runoff in the Potomac River basin, by W. S. Eisenlohr, Jr .............................................................................................. 178
174. Use of regionalized flood-frequency curves in adjusting flow-duration curves, by G. A. Kirkpatrick and J. A. McCabe .............................................................................................. 179
175. A control structure for measuring water discharge and sediment load, by E. V. Richardson and D. D. Harris .............................................................................................. 182
176. Use of a radioisotope to measure water discharge, by B. J. Frederick, C. W. Reck, and R. W. Carter .............................................................................................. 185

Quality of water
177. Solute degradation in the Potomac River basin, by H. R. Feltz and J. W. Wark .............................................................................................. 186
178. Foaming characteristics of synthetic-detergent solutions, by C. H. Wayman, J. B. Robertson, and H. G. Page .............................................................................................. 188
179. Surface tension of detergent solutions, by C. H. Wayman, J. B. Robertson, and H. G. Page .............................................................................................. 190

INDEXES

Subject .............................................................................................................................. 193
Author .............................................................................................................................. 195
Previously undescribed fossiliferous Jurassic marine sedimentary rocks having a cumulative thickness of more than 9,000 feet are well exposed in the McCarthy C-5 quadrangle, Alaska, where they were mapped by MacKevett and M. C. Blake, Jr., during 1961. Provisional field identifications of fossils by D. L. Jones, of the U.S. Geological Survey, facilitated the mapping, and paleontologic studies by Imlay determined the geologic ages of the Jurassic rocks.

The 15- by 22½-minute McCarthy C-5 quadrangle is in rugged terrain having a relief in excess of 11,000 feet on the southern flank of the Wrangell Mountains, about 200 miles east of Anchorage (fig. 133.1). Moffit (1938), during his extensive reconnaissance mapping in the general region, recognized only two small patches of Jurassic rocks within the McCarthy C-5 quadrangle, and he grouped most of the Jurassic rocks with Cretaceous rocks or with the McCarthy Shale of Late Triassic age.

The nearest exposed Jurassic sequence that has been mapped in detail is in the Talkeetna Mountains A-1, A-2, and B-1 quadrangles in the Nelchina area, about 150 miles northwest of McCarthy (fig. 133.1). Grantz (1960a, b) described this fossiliferous Jurassic section as being over 15,000 feet thick and consisting of Lower Jurassic submarine volcanic and sedimentary rocks, Middle Jurassic nearshore sandstone, and Upper Jurassic siltstone, sandstone, and conglomerate.

The Jurassic rocks consist of a conformable sequence that appears to overlie the McCarthy Shale of Late Triassic age conformably, and is unconformably overlain by Cretaceous marine sedimentary rocks or by Tertiary continental and lacustrine sedimentary rocks that are intercalated with the basal part of the Wrangell Lava. A hiatus separates the rocks of Early Jurassic age from younger Jurassic rocks, and other gaps probably occur within the Jurassic sequence despite the apparent conformity of the stratigraphic succession.

The Lower and Middle (?) Jurassic strata, which constitute about a third of the Jurassic section, consist chiefly of limestone and shale. The overlying thick Upper Jurassic sequence consists dominantly of shale but locally contains sandstone and conglomerate in its higher part.

Five Jurassic units are delineated on the map (fig. 133.2), and a summary of the lithology, the indicated geologic age, and the stratigraphic range of the important fauna of the Jurassic rocks is shown in figure 133.3. The lowermost of these, J1, is composed of light- to medium-brown-weathering silty limestone and shale, contains mollusks of Sinemurian age, and overlies the evenly bedded McCarthy Shale, which weathers dark brown. This unit is overlain by a distinctive sandy and silty limestone unit, J5, that contains abundant fossils of the Early Jurassic pectenid *Weyla*. Prof. S. W. Muller, of Stanford University, has examined several of the *Weylas* and believes that they are indicative of a Pliensbachian (Early Jurassic) age (oral communication, 1961). The unit forms bold outcrops and is an excellent marker that is traceable across the quadrangle.

These Lower Jurassic rocks are locally overlain by reddish-brown shale and limestone, J5, that contain diagnostic ammonites indicative of a Middle (?) or possibly an early Late Jurassic age.

A widespread unit composed mainly of shale, Jsh,
FIGURE 133.2.—Generalized geologic map showing the distribution of Jurassic rocks in the McCarthy C-5 quadrangle. QTKs, Sedimentary and volcanic rocks, Cretaceous or Tertiary, and surficial deposits, Quaternary; Jsh, shale, and Jo, conglomerate, Upper Jurassic; Js, shale and limestone, Middle (?) and Upper Jurassic; Jls, limestone, and J1, limestone and shale, Lower Jurassic; Tmc, McCarthy Shale, Upper Triassic.
directly overlies either the shale and limestone unit (J's) or the subjacent limestone unit (Jls) with apparent conformity. It contains abundant Buchias and a few diagnostic ammonites. Brown-weathering sandstone that occurs high in the upper shale unit is locally transitional into a pebble or cobble conglomerate, Jc (figs. 133.2, 133.3). An angular unconformity marks the contact between the Jurassic and the Cretaceous or Tertiary rocks.

REFERENCES

