



SMITHSONIAN SCIENTIFIC SERIES

Editor-in-chief

CHARLES GREELEY ABBOT, D.Sc.

*Secretary of the
Smithsonian Institution*



Published by

SMITHSONIAN INSTITUTION SERIES, Inc.
NEW YORK

MINERALS FROM EARTH AND SKY

PART I THE STORY OF METEORITES

By

GEORGE P. MERRILL

*Head Curator, Department of Geology,
U. S. National Museum*

PART II GEMS AND GEM MINERALS

By

WILLIAM F. FOSHAG

*Assistant Curator, Division of Mineralogy and Petrology,
Department of Geology, U. S. National Museum*

VOLUME THREE
OF THE
SMITHSONIAN SCIENTIFIC SERIES

508
C. 3065

COPYRIGHT 1929, 1934, BY
SMITHSONIAN INSTITUTION SERIES, INC.
[Printed in the United States of America]
All rights reserved



Copyright Under the Articles of the Copyright Convention
of the Pan-American Republics and the
United States, August 11, 1910

CONTENTS

PART I

THE STORY OF METEORITES

I.	INTRODUCTORY AND HISTORICAL	I
II.	PHENOMENA INCIDENTAL TO FALL	27
III.	AREAS OF DISTRIBUTION	42
IV.	NUMBER, SIZE, AND FORM.	54
V.	COMPOSITION AND STRUCTURE	64
VI.	NAMES AND CLASSIFICATION	79
VII.	WHENCE DO THEY COME?	82
VIII.	EARLY USES OF METEORIC IRON	100
	BIBLIOGRAPHY	107
	APPENDIX I: CLASSIFICATION OF METEORITES	109
	APPENDIX II: LIST OF METEORITES SEEN TO FALL	115

PART II

GEMS AND GEM MINERALS

I.	INTRODUCTION	169
II.	CRYSTALS AND THEIR GROWTH	172
III.	PROPERTIES OF MINERALS	178
IV.	KINDS AND OCCURRENCES OF GEM MINERALS	190
V.	SYNTHETIC GEMS	289
VI.	COLLECTIONS AND COLLECTORS	291
VII.	CUTTING OF GEMS	306
VIII.	GEMS MENTIONED IN THE BIBLE	316
	BIBLIOGRAPHY	320
	INDEX	323

ILLUSTRATIONS

LIST OF PLATES

PART I

	A falling meteorite	<i>Frontispiece</i>
1.	Looking into "empty space"	4
2.	Fall of a meteorite in a field	5
3.	Meteorite stone, New Concord, Ohio	16
4.	Small stones of Holbrook, Arizona, meteorite	20
5.	Meteorite stone, Allegan, Michigan	21
6.	Meteorite iron, Mazapil, Mexico	22
7.	Meteor Crater, Arizona	24
8.	Portrait of E. F. F. Chladni	26
9.	Diagram of earth and sun	27
10.	View of a portion of the moon's surface	28
11.	Fall of a meteorite at Montpreis, Styria	32
12.	Meteorite iron, Casas Grandes, Chihuahua, Mexico	36
13.	The Cape York meteorite iron	38
14.	The Willamette meteorite iron	40
15.	The Bacubirito, Sinaloa, Mexico, meteorite iron	56
16.	Iron meteorite, Owens Valley, California	57
17.	Polished slice of Cumberland Falls, Kentucky, meteorite stone	60
18.	Etched surface of slice from Casas Grandes meteorite iron	68
19.	Polished surface from fragment of Admire, Kansas, pallasite; granular and hexahedral structure of meteorite irons	70
20.	Microsections of meteorites	71
21.	Polished slice from Mount Vernon, Kentucky, pallasite	72
22.	Microsections of meteorites	73
23.	Microsections of meteorites	74
24.	Chondrules and chondritic structure	75
25.	Five views of chondrules as shown in thin sections	76
26.	(1) Chondrule in the Parnallee meteorite stone; (2) feldspar in the Estherville meteorite	77

27.	(1 and 2) Toluca meteoric iron before and after heating; (3) polished surface of Cumberland Falls meteoric stone.	78
28.	Portraits of F. Berwerth, J. L. Smith, H. C. Sorby, and C. U. Shepard.	84
29.	Portraits of S. Meunier, A. Daubrée, G. Tschermak, and D. Olmsted	88
30.	Portraits of H. A. Newton and Norman Lockyer	89
31.	Biela's comet before and after division	92
32.	The Tucson, Arizona, meteoric iron	104
33.	The Baldwyn, Mississippi, meteoric stone	116
34.	The Bath Furnace, Kentucky, meteoric stone	117
35.	Fragment from Ensisheim meteoric stone	124
36.	The Felix, Alabama, meteoric stone	125
37.	The Fisher, Polk County, Minnesota, meteoric stone	128
38.	The Gopalpur, India, meteoric stone	129
39.	The Hessle, Sweden, meteoric stone	132
40.	The Kilbourn, Wisconsin, meteoric stone	133
41.	One individual of the Modoc, Kansas, meteoric stone	140
42.	Two views of the N'Gourema, Africa, meteoric iron	162

PART II

43.	Characteristic forms of crystals	174
44.	Quartz with inclusions of rutile, "Thetis hair stone," and a crystal of quartz	175
45.	Kimberley mine, Kimberley, South Africa	194
46.	Trenches in diamond-bearing peridotite, Pike County, Arkansas	198
47.	Uncut diamonds, Arkansas	200
48.	Glacial map of the Great Lakes region	202
49.	Sapphire mining, Palmadulla, Ceylon	206
50.	Sapphire mining, Judith Basin County, Montana	207
51.	Beryl and emerald crystals	210
52.	Beads of citrine and rose quartz	224
53.	Characteristic forms of agate	226
54.	Landscape or "moss" agates	228
55.	Beads and cut stones of silicified wood, Fossil Forest, Arizona	232
56.	Opal diggings, Virgin Valley, Nevada	234
57.	Tourmaline. Crystals from Mesa Grande, California, and cross section from Madagascar	238
58.	Tourmaline-feldspar mine, Auburn, Maine	240
59.	Group of tourmaline crystals, Mesa Grande, California—Roebing collection	242
60.	Tourmaline mine, Mesa Grande, California	244

61.	Five cut gems from Isaac Lea and Roebling collections	246
62.	Spodumene crystal, variety Kunzite	250
63.	Chinese Han disk of Jade	252
64.	Variscite, Lewiston, Utah, and turquoise in matrix, Los Cerrillos, New Mexico	256
65.	Turquoise mine, near Los Cerrillos, New Mexico	260
66.	Amazonstone and smoky quartz, Pikes Peak, Colorado	264
67.	Titanite (sphene)	272
68.	Semi-precious stones	274
69.	Malachite and azurite, Bisbee, Arizona	276
70.	Iceland spar, illustrating double refraction	280
71.	Semi-precious stones	286
72.	Portrait of James Smithson	296
73.	Portraits of C. S. Bement, W. S. Vaux, George Vaux, and Isaac Lea	297
74.	Portraits of Washington A. Roebling, F. A. Canfield, George F. Kunz, and W. S. Disbrow	302

LIST OF TEXT FIGURES

PART I

1.	Fall of meteorite at Ensisheim, Germany	8
2.	Area of distribution of Canyon Diablo meteorite	23
3.	Fall of meteorite at Knyahinya, Hungary	29
4.	The afterglow of meteorites	32
5.	Areal distribution of Homestead, Iowa, fall	43
6.	Diamond crystal out of Canyon Diablo meteorite	66
7.	Diagrams of an iron showing Widmanstätten figures	71

PART II

8.	Eglestonite crystal with 482 faces	173
9.	Brilliant cut	309
10.	Double brilliant cut	310
11.	Half brilliant cut	310
12.	Trap brilliant cut	311
13.	Portuguese cut	311
14.	Star cut	312
15.	Rose cut	312
16.	Trap or step cut	313
17.	Step brilliant or mixed cut	313
18.	Table cut	314
19.	Cabochon cut.	314