

Catalogue no. 31, 3rd edition



**KRANTZ**

*"DANA-SETS"  
of wooden crystal models*

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RHEINISCHES MINERALIEN-KONTOR  
Founded 1833

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D a n a s e t s of wooden crystal models,  
arranged by the late Professor William E. Ford to illustrate Dana's  
Textbook of Mineralogy 4th edition. Part I. Crystallography.  
The third edition of this catalogue was kindly revised by Professor  
Cornelius S. Hurlbut, Jr., Harvard University, Cambridge, Massachusetts.  
In the isometric system the face symbol (hkl) in which  $h < k < l$  is used  
as the form symbol {hkl}.

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I. ISOMETRIC SYSTEM.

1. Hexoctahedral Class.

Price  
Group

1. Fig. 110.	Cube {001}	1
2. " 111.	Octahedron {111}	1
3. " 112.	Dodecahedron {011}	2
4. " 113.	Cube {001} and octahedron {111}	2
5. " 114.	Cube {001} and octahedron {111} "in equilibrium"	2
6. " 115.	Octahedron {111} and cube {001}	2
7. " 116.	Dodecahedron {011} and cube {001}	2
8. " 117.	Octahedron {111} and dodecahedron {011}	2
9. " 118.	Dodecahedron {011} and octahedron {111}	2
10. " 119.	Cube {001} and dodecahedron {011}	2
11. " 120.	Cube {001}, dodecahedron {011} and octahedron {111}	3
12. " 121.	Octahedron {111}, cube {001} and dodecahedron {011}	3
13. " 122.	Tetrahexahedron {012}	3
14. " 123.	Tetrahexahedron {014}	3
15. " 124.	Tetrahexahedron {035}	3
16. " 125.	Cube {001} and tetrahexahedron {012}	3
17. " 126.	Octahedron {111} and tetrahexahedron {013}	4
18. " 127.	Dodecahedron {011} and tetrahexahedron {014}	4



		Price Group
19. Fig. 128.	Trisectahedron {122}	3
20. " 129.	Cube {001} and trisectahedron {122}	3
21. " 130.	Octahedron {111} and trisectahedron {122} - Galena	4
22. " 131.	Trapezohedron {112}	3
23. " 132.	Trapezohedron {113}	3
24. " 133.	Cube {001} and trapezohedron {112} - Analcite	3
25. " 134.	Trapezohedron {112} and octahedron {111} - Analcite	4
26. " 135.	Trapezohedron {112} and dodecahedron {011} - Garnet	4
27. " 136.	Dodecahedron {011} and trapezohedron {112} - Garnet	4
28. " 137.	Octahedron {111} and trapezohedron {113} - Spinel	4
29. " 138.	Dodecahedron {011} and trapezohedron {113} - Magnetite	4
30. " 139.	Hexoctahedron {123}	5
31. " 140.	Hexoctahedron {124}	5
32. " 141.	Cube {001} and hexoctahedron {123} - Fluorite	5
33. " 142.	Dodecahedron {011} and hexoctahedron {123} - Garnet	5
2. Diploidal Class - $2/m\bar{3}$		
34. " 147.	Pyritohedron (plus form) {102}	2
35. " 148.	Pyritohedron (minus form) {012}	2
36. " 150.	Cube {001} and pyritohedron {102}	2
37. " 151.	Octahedron {111} and pyritohedron {102}	2
38. " 152.	Octahedron {111} and pyritohedron {102} "in equilibrium"	2
39. " 153.	Diploid {213}	3
40. " 154.	Cube {001} and diploid {213}	3
41. " 155.	Diploid {213}, cube {001}, pyritohedron {102} and octahedron {111}	5
42. " 156.	Pyritohedron {102}, cube {001}, diploid {213} and octahedron {111}	5

		Price Group
3. Hextetrahedral Class - $\bar{4}3m$		
43. Fig. 159.	Tetrahedron (plus form) {111}	1
44. " 160.	Tetrahedron (minus form) {1 $\bar{1}$ 1}	1
45. " 162.	Tetrahedron, combination of the plus form {111} and the minus form {1 $\bar{1}$ 1}	1
46. " 163.	Cube {001} and tetrahedron {111}	2
47. " 164.	Tetrahedron {111} and cube {001}	2
48. " 165.	Tetrahedron {111} and dodecahedron {011}	2
49. " 166.	Cube {001}, dodecahedron {011}, tetrahedron {111} and minus tetrahedron {1 $\bar{1}$ 1} Boracite	3
50. " 167.	Deltoid dodecahedron {122}	2
51. " 168.	Tristetrahedron {112}	2
52. " 169.	Hextetrahedron {123}	3
53. " 170.	Tetrahedron {111} and tristetrahedron {112} - Tetrahedrite	2
54. " 171.	Dodecahedron {011}, cube {001}, tristetrahedron {113} and tetrahedron {111} - Sphalerite	4
55. " 172.	Cube {001}, dodecahedron {011}, tetrahedron {111}, hextetrahedron {135}, minus tetrahedron {1 $\bar{1}$ 1}, and minus tristetrahedron {1 $\bar{1}$ 2} - Boracite	5
4. Gyroidal Class - $432$		
56. " 174.	Right-hand gyroid {123}	3
57. " 175.	Left-hand gyroid {213}	3
58. " 176.	Gyroid {10.12.15} and cube {001} - Cuprite	3
5. Tetartoidal Class - $23$		
59. " 178.	Positive right tetartoid {123}	2
60. " 179.	Positive left tetartoid {213}	2



## II. TETRAGONAL SYSTEM.

Price  
Group1. Ditetragonal-Dipyramidal Class -  $4/m\ 2/m\ 2/m$ 

61.	Fig. 188.	First-order prism $\{110\}$ with base $\{001\}$	1
62.	" 189.	Second-order prism $\{010\}$ with base $\{001\}$	1
63.	" 190.	First-order prism $\{110\}$ , second-order prism $\{010\}$ , base $\{001\}$	2
64.	" 191.	Ditetragonal prism $\{210\}$ and base $\{001\}$	2
65.	" 192.	First-order dipyramid $\{111\}$ - Octahedrite	2
66.	" 193.	First-order prism $\{110\}$ and dipyramid $\{111\}$ - Zircon	2
67.	" 194.	First-order prism $\{110\}$ with dipyramids $\{331\}$ and $\{111\}$ - Zircon	2
68.	" 195.	Second-order prism $\{010\}$ with first-order dipyramid $\{111\}$ - Apophyllite	2
69.	" 196.	Second-order dipyramid $\{011\}$ - Idocrase	2
70.	" 197.	Second-order prism $\{010\}$ and dipyramid $\{011\}$ - Rutile	2
71.	" 198.	Prisms $\{110\}$ and $\{010\}$ with dipyramids $\{011\}$ and $\{111\}$ - Rutile	3
72.	" 199.	First-order prism and dipyramids $\{110\}$ and $\{111\}$ with base $\{001\}$ - Idocrase	2
73.	" 200.	First-order dipyramid $\{111\}$ , first- and second-order prisms $\{110\}$ $\{010\}$ - Idocrase	2
74.	" 201.	First- and second-order dipyramids $\{111\}$ and $\{011\}$ - Cassiterite	2
75.	" 202.	First-order prism $\{110\}$ and dipyramid $\{111\}$ , second-order prism $\{010\}$ , base $\{001\}$ - Idocrase	2
76.	" 203.	Second-order prism $\{010\}$ , base $\{001\}$ , dite- tragonal prism $\{310\}$ , dipyramid $\{111\}$ - Apophyllite	3
77.	" 204.	First-order dipyramids $\{111\}$ $\{115\}$ and prism $\{110\}$ ; second-order dipyramids $\{011\}$ , $\{015\}$ , $\{021\}$ , base $\{001\}$ - Octahedrite	5
78.	" 205.	Ditetragonal dipyramid $\{122\}$	2
79.	" 206.	First- and second-order prisms $\{110\}$ , $\{010\}$ , ditetragonal dipyramid $\{311\}$ , dipyramid $\{111\}$ - Zircon	4

Price  
Group

80.	Fig. 207.	First-order prism $\{110\}$ , ditetragonal prism $\{120\}$ , ditetragonal dipyramid $\{231\}$ , dipyramids $\{111\}$ and $\{011\}$ - Cassiterite	4
81.	" 208.	First-order prism $\{110\}$ , second-order prism $\{010\}$ , ditetragonal prism $\{130\}$ , ditetragonal dipyramids $\{133\}$ and $\{231\}$ , dipyramids $\{111\}$ and $\{011\}$ - Rutile	5

2. Tetragonal-Dipyramidal Class -  $4/m$ 

82.	" 214.	Third-order tetragonal prism $\{120\}$ and base $\{001\}$	1
83.	" 215.	Third-order tetragonal dipyramid $\{122\}$	2
84.	" 217.	Dipyramids $\{111\}$ and $\{011\}$ - Scheelite	2
85.	" 218.	Dipyramids $\{011\}$ and $\{111\}$ with third order dipyramids $\{212\}$ and $\{131\}$ - Scheelite	4
86.	" 219.	First-order prism $\{110\}$ and dipyramid $\{111\}$ , second-order prism $\{010\}$ , third order dipyramid $\{311\}$ - Meionite	3

## 3. Tetragonal-Pyramidal Class - 4

87.	" 221.	First-order prism $\{110\}$ , pyramids $\{111\}$ and $\{1\bar{1}\bar{1}\}$ , pedion $\{001\}$ , third order prism $\{230\}$ - Wulfenite	2
88.	" 222.	Second-order pyramids $\{011\}$ , $\{01\bar{1}\}$ , $\{012\}$ , $\{01\bar{2}\}$ ; pedion $\{001\}$ , first-order pyramids $\{111\}$ , $\{11\bar{1}\}$ , third-order prism $\{210\}$ - Wulfenite	3
89.	" 223.	Pyramids $\{111\}$ , $\{11\bar{1}\}$ and $\{01\bar{1}\}$ and third order pyramids $\{432\}$ and $\{31\bar{1}\}$ - Wulfenite	3

4. Tetragonal-Scaleno-hedral Class -  $\bar{4}2m$ 

90.	" 225.	Disphenoid $\{111\}$	1
91.	" 226.	Tetragonal scalenohedron $\{122\}$	2
92.	" 227.	Positive and negative disphenoids $\{111\}$ and $\{1\bar{1}\bar{1}\}$ - Chalcopyrite	1
93.	" 228.	Positive and negative disphenoids $\{111\}$ and $\{1\bar{1}\bar{1}\}$ , base $\{001\}$ , dipyramids of second order $\{011\}$ and $\{021\}$ - Chalcopyrite	3



- |               |  | Price<br>Group |
|---------------|--|----------------|
| 94. Fig. 229. | Second-order dipyrramids $\{011\}$ , $\{021\}$ ;<br>base $\{001\}$ , first-order prism $\{110\}$ ,<br>disphenoid $\{111\}$ , scalenohedron $\{135\}$ -<br>Chalcopyrite | 4              |

## 5. Tetragonal-Trapezohedral Class - 422

- |            |                                    |   |
|------------|------------------------------------|---|
| 95. " 231. | Tetragonal trapezohedron $\{hkl\}$ | 2 |
|------------|------------------------------------|---|

## III. HEXAGONAL SYSTEM.

## A. Hexagonal Division.

1. Dihexagonal-Dipyramidal Class  $6/m\ 2/m\ 2/m$ 

- |             |  |   |
|-------------|--|---|
| 96. " 238.  | First-order prism $\{10\bar{1}0\}$ and base $\{0001\}$   | 1 |
| 97. " 239.  | Second-order prism $\{11\bar{2}0\}$ and base $\{0001\}$  | 1 |
| 98. " 240.  | Dihexagonal prism $\{21\bar{3}0\}$ and base $\{0001\}$   | 2 |
| 99. " 242.  | First-order dipyramid $\{10\bar{1}1\}$   | 2 |
| 100. " 243. | Second-order dipyramid $\{11\bar{2}2\}$  | 2 |
| 101. " 244. | Dihexagonal-dipyramid $\{21\bar{3}1\}$   | 3 |
| 102. " 245. | First-order prism $\{10\bar{1}0\}$ , first-order di-<br>pyramids $\{10\bar{1}1\}$ $\{20\bar{2}1\}$ , second-order di-<br>pyramid $\{11\bar{2}1\}$ , dihexagonal dipyramid<br>$\{21\bar{3}1\}$ , base $\{0001\}$ - Beryl                                  | 4 |
| 103. " 246. | First-order prism $\{10\bar{1}0\}$ and dipyramids<br>$\{10\bar{1}0\}$ $\{20\bar{2}1\}$ , second-order prism $\{11\bar{2}0\}$<br>and dipyramid $\{11\bar{2}1\}$ , dihexagonal dipyra-<br>mids $\{21\bar{3}1\}$ $\{31\bar{4}1\}$ , base $\{0001\}$ - Beryl | 5 |

2. Hexagonal-Dipyramidal Class  $6/m$ 

- |             |  |   |
|-------------|--|---|
| 104. " 251. | Third-order prism $\{21\bar{3}0\}$ and base $\{0001\}$   | 1 |
| 105. " 252. | Third-order dipyramid $\{21\bar{3}3\}$   | 2 |
| 106. " 254. | First- and third-order prisms $\{10\bar{1}0\}$ $\{21\bar{3}0\}$ ,<br>first-order dipyramids $\{10\bar{1}1\}$ $\{10\bar{1}2\}$ $\{20\bar{2}1\}$ ,<br>second-order dipyramids $\{11\bar{2}1\}$ $\{11\bar{2}2\}$ ,<br>third-order dipyramids $\{21\bar{3}1\}$ $\{31\bar{4}1\}$ ,<br>base $\{0001\}$ - Apatite | 5 |

## 3. Hexagonal-Trapezohedral Class - 622

- |                |  |   |
|----------------|--|---|
| 107. Fig. 258. | Hexagonal trapezohedron $\{21\bar{3}1\}$ | 2 |
|----------------|--|---|

4. Ditrigonal-Dipyramidal Class  $\bar{6}m2$ 

- |             |  |   |
|-------------|--|---|
| 108. " 260. | Trigonal prisms $\{10\bar{1}0\}$ $\{01\bar{1}0\}$ and di-<br>pyramids $\{10\bar{1}1\}$ $\{01\bar{1}1\}$ $\{01\bar{1}2\}$ , second-<br>order prism $\{11\bar{2}0\}$ and dipyramid $\{22\bar{4}1\}$ ,<br>base $\{0001\}$ - Benitoite | 5 |
|-------------|--|---|

## B. Rhombohedral Division.

1. Hexagonal-Scalenohedral Class  $\bar{3}2/m$ 

- |             |  |   |
|-------------|--|---|
| 109. " 263. | Positive rhombohedron $\{10\bar{1}1\}$ - Calcite   | 1 |
| 110. " 264. | Negative rhombohedron $\{01\bar{1}1\}$ - Calcite   | 1 |
| 111. " 265. | Positive rhombohedron $\{10\bar{1}1\}$ - Hematite  | 1 |
| 112. " 266. | Negative rhombohedron $\{01\bar{1}2\}$ - Calcite   | 1 |
| 113. " 267. | Negative rhombohedron $\{05\bar{5}4\}$ - Calcite   | 1 |
| 114. " 268. | Negative rhombohedron $\{02\bar{2}1\}$ - Calcite   | 1 |
| 115. " 269. | Positive rhombohedron $\{40\bar{4}1\}$ - Calcite   | 1 |
| 116. " 270. | Positive and negative rhombohedrons:<br>$\{16.0.\bar{1}6.1\}$ $\{01\bar{1}2\}$ - Calcite   | 2 |
| 117. " 271. | Negative and positive rhombohedrons<br>$\{02\bar{2}1\}$ $\{10\bar{1}1\}$ - Calcite   | 2 |
| 118. " 272. | First-order prism $\{10\bar{1}0\}$ , positive and<br>negative rhombohedrons $\{10\bar{1}1\}$ $\{01\bar{1}1\}$ -<br>Gmelinite                   | 2 |
| 119. " 273. | First-order prism $\{10\bar{1}0\}$ , positive and<br>negative rhombohedrons $\{10\bar{1}1\}$ $\{01\bar{1}1\}$ ,<br>base $\{0001\}$ - Gmelinite | 2 |
| 120. " 274. | Rhombohedron $\{10\bar{1}1\}$ and base $\{0001\}$ -<br>Hematite  | 2 |
| 121. " 275. | Base $\{0001\}$ , rhombohedron $\{10\bar{1}1\}$ and<br>second-order prism $\{11\bar{2}0\}$ - Hematite  | 2 |
| 122. " 276. | Two rhombohedra $\{30\bar{3}2\}$ $\{10\bar{1}1\}$ ,<br>second-order prism $\{11\bar{2}0\}$ and base $\{0001\}$ -<br>Coquimbite                 | 2 |



		Price Group
123. Fig. 277.	First- and second-order prisms $\{10\bar{1}0\}$ $\{11\bar{2}0\}$ , positive rhombohedra $\{10\bar{1}1\}$ $\{10\bar{1}4\}$ , negative rhombohedra $\{02\bar{2}1\}$ $\{01\bar{1}2\}$ , scalenohedron $\{21\bar{3}1\}$ and base $\{0001\}$ - Eudialyte	5
124. " 278.	Scalenohedron $\{21\bar{3}1\}$ - Calcite	2
125. " 279.	Positive scalenohedron $\{21\bar{3}1\}$ and positive rhombohedron $\{10\bar{1}1\}$ - Calcite	2
126. " 280.	First-order prism $\{10\bar{1}0\}$ , scalenohedron $\{21\bar{3}1\}$ , rhombohedron $\{10\bar{1}1\}$ - Calcite	3
127. " 281.	Rhombohedral $\{10\bar{1}1\}$ , scalenohedron $\{21\bar{3}1\}$ - Calcite	2
128. " 282.	Rhombohedral $\{02\bar{2}1\}$ , scalenohedron $\{13\bar{4}1\}$ , base $\{0001\}$ - Calcite	2
129. " 283.	Second-order dipyrmaid $\{22\bar{4}3\}$ - Corundum	2
130. " 284.	Second-order dipyrmaids $\{14.14.\bar{2}8,3\}$ $\{22\bar{4}1\}$ $\{22\bar{4}3\}$ , rhombohedron $\{10\bar{1}1\}$ , base $\{0001\}$ - Corundum	5
131. " 285.	Second-order prism $\{11\bar{2}0\}$ and dipyrmaids $\{11\bar{2}2\}$ $\{11\bar{2}4\}$ , base $\{0001\}$ - Spangolite	4
132. " 287.	First- and second-order prisms $\{10\bar{1}0\}$ $\{11\bar{2}0\}$ , positive rhombohedron $\{10\bar{1}1\}$ , negative rhombohedra $\{01\bar{1}2\}$ $\{02\bar{2}1\}$ , scalenohedra $\{21\bar{3}1\}$ $\{21\bar{3}4\}$ - Calcite	4

2. Ditrigonal-Pyramidal Class -  $3m$ 

133. " 291.	Trigonal prisms $\{10\bar{1}0\}$ $\{01\bar{1}0\}$ , second-order prism $\{11\bar{2}0\}$ , positive trigonal pyramids $\{10\bar{1}1\}$ $\{02\bar{2}1\}$ , negative trigonal pyramids $\{01\bar{1}1\}$ $\{10\bar{1}2\}$ - Tourmaline	3
134. " 292.	Positive trigonal pyramids $\{10\bar{1}1\}$ $\{02\bar{2}1\}$ , negative trigonal pyramid $\{01\bar{1}1\}$ , trigonal prism $\{10\bar{1}0\}$ , second-order prism $\{11\bar{2}0\}$ - Tourmaline	3
135. " 293.	Trigonal prisms $\{10\bar{1}0\}$ $\{01\bar{1}0\}$ , second order prism $\{11\bar{2}0\}$ , positive trigonal pyramids $\{10\bar{1}1\}$ $\{40\bar{4}1\}$ $\{02\bar{2}1\}$ , negative trigonal pyramids $\{01\bar{1}1\}$ $\{10\bar{1}2\}$ , ditrigonal pyramids $\{12\bar{3}2\}$ $\{32\bar{5}1\}$ , pedion $\{0001\}$ - Tourmaline	5

136. Fig. 294. Trigonal prism  $\{10\bar{1}0\}$ , second-order prism  $\{11\bar{2}0\}$ , positive trigonal pyramid  $\{02\bar{2}1\}$ , negative trigonal pyramids  $\{01\bar{1}1\}$   $\{10\bar{1}2\}$  - Tourmaline

Price Group

2

3. Rhombohedral Class -  $\bar{3}$ 

137. " 296.	Second-order prism $\{11\bar{2}0\}$ , negative rhombohedron $\{02\bar{2}1\}$ , third-order rhombohedron $\{13\bar{4}1\}$ - Dioptase	2
138. " 297 & 298.	First- and second-order prisms $\{10\bar{1}0\}$ $\{11\bar{2}0\}$ , third-order rhombohedra $\{12\bar{3}2\}$ $\{21\bar{3}1\}$ , positive and negative rhombohedra $\{10\bar{1}1\}$ $\{01\bar{1}2\}$ - Phenacite	4

4. Trigonal-Trapezohedral Class -  $32$ 

139. " 301.	Right hand trigonal trapezohedron $\{21\bar{3}3\}$	1
140. " 302.	Left hand trigonal trapezohedron $\{31\bar{2}3\}$	1
141. " 303.	First-order prism $\{10\bar{1}0\}$ , positive and negative rhombohedra $\{10\bar{1}1\}$ $\{01\bar{1}1\}$ - Quartz	2
142. " 304.	Positive and negative rhombohedra $\{10\bar{1}1\}$ $\{01\bar{1}1\}$ - Quartz	2
143. " 305.	First-order prism $\{10\bar{1}0\}$ , positive and negative rhombohedra $\{10\bar{1}1\}$ $\{01\bar{1}1\}$ , trigonal dipyrmaid $\{11\bar{2}1\}$ , right hand trapezohedron $\{51\bar{6}1\}$ - Quartz	3
144. " 306.	Corresponding left hand model to No. 143 $\{10\bar{1}0\}$ $\{10\bar{1}1\}$ $\{01\bar{1}1\}$ $\{21\bar{3}1\}$ $\{61\bar{5}1\}$ - Quartz	3
145. " 307.	First-order prism $\{10\bar{1}0\}$ , positive rhombohedra $\{10\bar{1}1\}$ $\{60\bar{6}5\}$ $\{50\bar{5}3\}$ $\{20\bar{2}1\}$ $\{30\bar{3}1\}$ $\{40\bar{4}1\}$ , negative rhombohedra $\{01\bar{1}1\}$ $\{07\bar{7}2\}$ , trigonal dipyrmaid $\{11\bar{2}1\}$ , trigonal trapezohedra $\{51\bar{6}1\}$ $\{41\bar{5}1\}$ $\{31\bar{4}1\}$ $\{32\bar{5}3\}$ $\{11.12.23.11\}$ $\{27\bar{9}9\}$ $\{21\bar{3}3\}$ - Quartz	5

## IV. ORTHORHOMBIC SYSTEM.

1. Rhombic-Dipyramidal Class  $2/m 2/m 2/m$ 

146. " 316.	Front $\{100\}$ , side $\{010\}$ and basal $\{001\}$ pinacoids	1
147. " 317.	Third-order prism $\{110\}$ , base $\{001\}$	1



		Price Group
148. Fig. 318.	Front pinacoid {100}, base {001}, third-order prisms {110} {210} {120}	2
149. " 319.	Second-order prism {101}, side pinacoid {010}	1
150. " 320.	First-order prism {011}, front pinacoid {100}	1
151. " 321.	Dipyramid {111}	2
152. " 322.	Base {001}, third-order prism {110} - Barite	1
153. " 323.	Base {001}, first-second- and third-order prisms {011} {102} {110} - Barite	2
154. " 324.	Basal, front and side pinacoids {001} {100} {010}, first-order prism {011} - Barite	2
155. " 325.	Base {001} with first and second-order prisms {011} {102} - Barite	2
156. " 326.	Second- and third-order prisms {102} {110} - Barite	1
157. " 327.	Base {001} with first-, second- and third- order prisms {011} {102} {011} tabular - Barite	2
158. " 328.	Base {001} with first-, second- and third- order prisms {011} {102} {011} prismatic - Barite	2
159. " 329.	First- and second-order prisms {011} {102} and base {001} - Barite	2
160. " 330.	Dipyramid {111} - Sulfur	2
161. " 331.	Dipyramids {111} {113} - Sulfur	2
162. " 332.	Dipyramids {111} {113}, first-order prism {011} and base {001} - Sulfur	3
163. " 333.	Second- and third-order prisms {101} {110}, side pinacoid {010} and base {001} - Staurolite	2
164. " 334.	Third order prisms {110} {120} and di- pyramid {111} - Topaz	2
165. " 335.	First- and third-order prisms {041} {110} {120}, dipyramid {221}, side pinacoid {010} Topaz	2
166. " 336.	Prisms: first-order {041} {021}, second- order {201} {401}, third-order {110} {120} {140}, dipyramids {221} {111} {223}, pinacoids: side {010}, basal {001} - Topaz	5

		Price Group
167. Fig. 341.	Front and side pinacoids {100} {010}, third-order prism {110}, first- and second order domes {031} {301}, pedion {001}, negative pyramid {121} - Hemimorphite	2
168. " 342.	Second-order domes {101} {101}, first-order dome {011}, side pinacoid {010} pedion {001} - Struvite	2
3. Rhombic-Disphenoidal Class - 222		
169. " 344.	Third-order prism {110}, disphenoid {111} - Epsomite	2

### V. MONOCLINIC SYSTEM .

#### 1. Prismatic Class - 2/m

170. " 353.	Front, side and basal pinacoids {100} {010} {001}	1
171. " 354.	Third-order prism {110}, basal pina- coid {001}	1
172. " 355.	Positive and negative second-order pina- coids {101} {101}, side pinacoid {010}	1
173. " 356.	Front, side, basal pinacoids {100} {010} {001} - Pyroxene	1
174. " 357.	Front, side and basal pinacoids {100} {010} {001}, third- and fourth-order prisms {110} {111} - Pyroxene	2
175. " 358.	Pinacoids: front {100}, side {010}, basal {001}, and second-order {101}; fourth-or- der prisms {111} {221} - Pyroxene	2
176. " 359.	Front and side pinacoids {100} {010}, third- and fourth-order prisms {110} {111} - Augite	2
177. " 360.	Basal and side pinacoids {001} {010}, second-order pinacoid {101}, third-order prisms {110} {130} - Orthoclase	2
178. " 361.	Basal and side pinacoids {001} {010}, second-order pinacoid {201}, third-order prisms {110} {130} - Orthoclase	2
179. " 362.	Basal and side pinacoids {001} {010}, second-order pinacoid {201}, prisms: first-order {021}, third-order {110} {130} fourth-order {111} - Orthoclase	3



		Price Group
180. Fig. 363.	Front, basal, second-order pinacoids $\{100\}$ $\{001\}$ $\{\bar{1}01\}$ , fourth-order prism $\{\bar{1}11\}$ - Epidote	2
181. " 364.	Side pinacoid $\{010\}$ , third- and fourth-order prisms $\{110\}$ $\{111\}$ - Gypsum	2
182. " 365.	Basal and front pinacoid $\{001\}$ $\{100\}$ , second-order pinacoids $\{101\}$ $\{201\}$ $\{301\}$ $\{\bar{1}01\}$ $\{\bar{2}01\}$ ; prisms: first-order $\{011\}$ $\{012\}$ , third-order $\{110\}$ , fourth-order $\{\bar{1}11\}$ $\{111\}$ $\{113\}$ $\{211\}$ - Epidote	5
183. " 366.	Base $\{001\}$ , front pinacoid $\{100\}$ , and second-order pinacoids $\{\bar{1}01\}$ $\{301\}$ elongated parallel to the $b$ axis Prisms: first-order $\{012\}$ $\{011\}$ , third-order $\{110\}$ $\{210\}$ , fourth-order $\{111\}$ $\{\bar{1}11\}$ Epidote	3

## 2. Sphenoidal Class - 2

184. " 370.	Front, basal and second-order pinacoids $\{100\}$ $\{001\}$ $\{101\}$ $\{\bar{1}01\}$ and sphenoids $\{110\}$ $\{\bar{1}\bar{1}0\}$ $\{011\}$ - Tartaric acid	2
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3. Domatic Class -  $\bar{m}$ 

185. " 372 & 373.	Side pinacoid $\{010\}$ , pedions $\{100\}$ $\{101\}$ $\{\bar{1}01\}$ with various domes $\{\bar{1}10\}$ $\{320\}$ $\{120\}$ $\{130\}$ $\{\bar{1}\bar{1}\bar{1}\}$ $\{\bar{1}11\}$ $\{111\}$ $\{351\}$ $\{551\}$ $\{771\}$ $\{\bar{5}31\}$ $\{\bar{1}31\}$ $\{\bar{1}3\bar{1}\}$ $\{\bar{1}2\bar{1}\}$ - Clinohedrite	4
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## VI. TRICLINIC SYSTEM .

Pinacoidal Class  $\bar{1}$ 

186. " 379.	Front pinacoid $\{100\}$ , side pinacoid $\{010\}$ basal pinacoid $\{001\}$	1
187. " 380.	Pinacoids: front $\{100\}$ , second-order $\{201\}$ , third-order $\{110\}$ $\{\bar{1}\bar{1}0\}$ , fourth-order $\{111\}$ $\{\bar{1}\bar{1}\bar{1}\}$ - Axinite	2
188. " 381.	Pinacoids: front $\{100\}$ , side $\{010\}$ , base $\{001\}$ , third-order $\{110\}$ $\{\bar{1}\bar{1}0\}$ , fourth-order $\{221\}$ $\{\bar{2}21\}$ $\{\bar{2}\bar{2}1\}$ $\{\bar{1}\bar{1}\bar{1}\}$ - Rhodonite	2

		Price Group
189. Fig. 382.	Pinacoids: Front $\{100\}$ , base $\{001\}$ , third-order $\{110\}$ $\{\bar{1}\bar{1}0\}$ , fourth-order $\{\bar{2}\bar{2}1\}$ $\{\bar{2}21\}$ - Rhodonite	2
190. " 383.	Pinacoids: Side $\{010\}$ , base $\{001\}$ , second-order $\{101\}$ $\{\bar{1}01\}$ , third-order $\{110\}$ $\{\bar{1}\bar{1}0\}$ - Albite	2
191. " 384.	Pinacoids: Side $\{010\}$ , base $\{001\}$ , first-order $\{021\}$ $\{0\bar{2}1\}$ $\{061\}$ , second-order $\{207\}$ $\{201\}$ , third-order $\{110\}$ $\{\bar{1}\bar{1}0\}$ $\{130\}$ $\{\bar{1}\bar{3}0\}$ fourth-order $\{111\}$ $\{\bar{1}\bar{1}\bar{1}\}$ $\{\bar{1}\bar{1}1\}$ $\{\bar{2}11\}$ $\{\bar{2}\bar{4}1\}$ - Anorthite	3
192. " 385.	Pinacoids: Front $\{100\}$ , side $\{010\}$ , first-order $\{021\}$ , second-order $\{201\}$ , third-order $\{110\}$ $\{\bar{1}\bar{1}0\}$ , fourth-order $\{111\}$ $\{\bar{1}\bar{1}\bar{1}\}$ $\{\bar{1}\bar{1}2\}$ $\{\bar{1}32\}$ - Axinite	3

## COMPOUND and TWIN CRYSTALS .

## Twin crystals.

193. " 406.	Thenardite $\{001\}$ $\{110\}$ $\{100\}$ $\{106\}$ , twin plane $\{011\}$ , penetration twin - orthorhombic	5
194. " 407.	Columbite $\{100\}$ $\{110\}$ $\{130\}$ $\{010\}$ $\{021\}$ $\{001\}$ $\{133\}$ , twin plane $\{021\}$ - orthorhombic	4
195. " 408.	Fluorite $\{001\}$ , twin plane $\{111\}$ , penetration twin - isometric	6

## The relation of the parts of twin crystals.

196. " 409 & 410.	Octahedron twin crystal - Spinel - twin plane $\{111\}$ - isometric	5
197. " 411.	Analcime - composite groups round a single nucleus - isometric	8
198. " 412A.	Left-hand quartz - hexagonal	3
199. " 412C.	Corresponding right-hand quartz - hexagonal	3
200. " 412B.	The combination of the two previous crystals into a twinned individual with the plane $\{11\bar{2}0\}$ , indicated by a line, as the twin plane - hexagonal	3



			Price Group
201. Fig. 413.	Hemimorphite, twin plane {001}; the upper and lower halves of the twin are reflections of each other over the twin plane - orthorhombic		5
202. " 414.	Twin similar to no. 201, but the prism and pedion faces of the two individuals coincide, thus eliminating the reentrant angles; the twin will therefore possess symmetry of the rhombic-dipyramidal class orthorhombic		3
203. " 415.	Biotite {001} {010} {111}, - composition face {001} - monoclinic		4
204. " 416.	Orthoclase {010} {110} {001} {101} - composition plane {010} - monoclinic		5
Contact and penetration twins.			
Contact twins see nos. 194, 196, 201.			
" 417.	Penetration twin of two cubes see model 195		6
205. " 418.	Fluorite - isometric Penetration twin of two tetrahedra with parallel axes - Tetrahedrite - isometric		6
206. " 419.	Penetration twin of rhombohedra - Chabazite, twin plane {0001} - hexagonal		6
Paragenic and repeated twinning.			
207. " 420.	Paragenic twin of Rutile {310} {111}, twin plane {011} - tetragonal		5
208. " 421.	Repeated twinning - threeling {111} {121} {010}, twin plane {031} - Chrysoberyl-orthorhombic		7
209. " 422.	Repeated twinning - threeling {111} {110}, twin plane {110} - Cerussite - tetragonal		6
210. " 423.	Repeated twinning - threeling {110} {010} {001} {101}, twin plane {232} - Staurolite - orthorhombic		6
211. " 424.	Repeated twinning - fiveling {111}, twin plane {111} - Spinel - isometric		6
212. " 425.	Repeated twinning - eightling {130}, twin plane {011} - Rutile - tetragonal		6

		Price Group
213. Fig. 426.	Repeated twinning - multiple twin - simulating an isometric crystal, see 264 - 266. Phillipsite - monoclinic	3

Examples of important methods of twinning.

I. ISOMETRIC SYSTEM .

1. Normal Class.

a) Contact twins:			
214. " 427.	Galena {111} {221} {110} {111}, twin plane {111}		6
215. " 428.	Copper {001}, twin plane {111}		5
216. " 429.	Copper {001}, twin plane {111} See also no. 196.		3
b) Penetration twins:			
217. " 430.	Galena {111} {001}, twin plane {111}		6
218. " 431.	Hauynite {111}, twin plane {111}		6
219. " 432.	Sodalite {011}, twin plane {111} See also no. 195.		6

2. Hemihedral Classes.

220. " 433.	Pyrite {210}, penetration twin, the cubic axis, the twin axis; so called "twin of the iron cross".		8
221. " 434.	Tetrahedrite, penetration of two tetrahedra, twin plane {111}		6
222. " 435.	Eulytite, penetration of two trigonal tristetrahedra with parallel axis		8
223. " 436.	Sphalerite {001} {111}, twin plane {111}		5
II. TETRAGONAL SYSTEM .			
224. " 437.	Cassiterite {110} {010} {111} {011}, twin plane {011}		5
225. " 438.	Zircon {110} {111} {231} {331}, twin plane {011}		4



		Price Group
226. Fig. 439.	Rutile {010} {110}, repeated twinning, twin plane {011}	6
227. " 440.	Hausmannite, repeated twinning analogous to no. 212.	7
228. " 441.	Rutile {010} {110} {530} {321} {111} {011} twin plane {031}	7
229. " 442.	Scheelite {101} {212} {111} {131}, twin axis c.	5
230. " 443.	Chalcopyrite {111} {111}, twin plane {111}	5

### III. HEXAGONAL SYSTEM.

231. " 444.	Pyrrhotite {20.0, 20.3} {0001}, twin plane {1011}, the vertical axes almost at right angles	6
232. " 445.	Calcite {1011} {0001}, twin plane {0001}	5
233. " 446.	Calcite {2131}, twin plane {0001} Chabazite, compare no. 206.	6
234. " 447.	Calcite {2131}, twin plane {0112}, distorted	5
235. " 448.	Calcite {2131}, twin plane {1011}	6
236. " 449.	Calcite {2131} {1010}, twin plane {1011}	6
237. " 450.	Calcite {1011} {1010} {0112} {3251}, twin plane {1011}	4
238. " 451.	Calcite {1011} {2131} {1341} {0221}, twin plane {1011}	6
239. " 452.	Calcite {2131}, twin plane {0221}	6
240. " 453.	Quartz {1010} {1011} {0111}, twin plane {1122}	6
241. " 454.	Quartz {1010} {1011} {0111} {5161}, twin axis c	3
242. " 455.	Quartz {1010} {1011} {0111} {5161} {6151}, twin plane {1120} Quartz, compare no. 198. - 200.	3

### IV. ORTHORHOMBIC SYSTEM.

243. " 456.	Aragonite {010} {110} {011}, twin plane {110}	5
244. " 457.	Aragonite, penetration twin of three individuals, twin plane {110}	6

		Price Group
245. Fig. 458.	Arsenopyrite {110} {0.1.24}, twin plane {101}	5
246. " 459.	Arsenopyrite {110} {011} {018}, cruciform threeling, twin plane {101}	6
247. " 460.	Columbite {100} {110} {130} {010} {103} {001} {111} {133} {021}, twin plane {023}	5
248. " 461.	Marcasite {101} {011} {013} {111}, twin plane {110}	6
249. " 462.	Marcasite {001} {011} fiveling, twin plane {110}	5
250. " 464.	Staurolite {110} {010} {001}, twin plane {032}	5
251. " 465.	Staurolite {110} {010} {001}, twin plane {230}	6
252. " 466.	Staurolite {010} {110} {001} {101}, twin plane {232}	8
253. " 467.	Staurolite {110} {010} {001} {101}, twin plane {032} and {232}	7
254. " 468.	Struvite {010} {001} {101} {120}, twin plane {001}	5

### V. MONOCLINIC SYSTEM.

255. " 469.	Augite {100} {110} {010} {111}, twin plane {100}	5
256. " 470.	Gypsum {010} {110} {111}, twin plane {100}	5
257. " 471.	Orthoclase {110} {010} {001} {201}, twin axis c, irregular penetration twin, "Carlsbad twin"	7
258. " 472.	Orthoclase {010} {001} {110} {111}, twin plane {021} "Baveno twin"	5
259. " 473.	Orthoclase {001} {110} {101}, repeated twin plane {021}	6
260. " 474.	Orthoclase {010} {001} {201} {101} {110}, twin plane {001} "Manebach twin"	5
261. " 475.	Wolframite {100} {110} {102} {011}, twin plane {023}	5
262. " 476.	Pyroxene {100} {110} {111}, stellated penetration twin, twin plane {122}	7
263. " 477.	Pyroxene {100} {110} {010} {111}, twin plane {101}	6



			Price Group
264.	Fig. 478.	Phillipsite {001} {010} {110}, cruciform fourling, twin plane {001}	3
265.	" 479.	Phillipsite, the previous twin crystal with an additional twin plane {011}	6
266.	" 480.	Phillipsite, the previous twin crystal with a further twin plane {110} Phillipsite compare no. 213.	8

#### VI. TRICLINIC SYSTEM .

267.	" 481.	Albite {010} {110} {001} {101} {111}, twin plane {010} "Albite law"	5
268.	" 482.	Albite, repeated twinning as in no. 113. crystal elongated in the direction of the <u>a</u> axis	6
269.	" 483.	Albite {001} {101} {201} {110} {110} {010} {111}, twin axis b, "Pericline law"	5
270.	" 484.	Albite, twin crystal according to the Albite and the Carlsbad law	6

#### Regular grouping of crystals.

271.	" 487.	Amphibole enclosing pyroxene in parallel position	6
272.	" 488.	Xenotime enclosing zircon in parallel position	6

#### Variations in the forms and dimensions of crystals.

##### I. Irregular malformation.

273.	" 489.	Quartz {1010} {1011} {0111} irregular malformed crystal	3
274.	" 490.	Quartz, the same combination as the previous model, also irregularly malformed Quartz compare no. 141.	3
275.	" 491.	Lazulite {111} {111} {101}, ideal crystal	3
276.	" 492.	Lazulite, the same faces, actual malformed crystal	3

##### II. Symmetrical malformation.

277.	Fig. 493.	Octahedron, flattened parallel to a face that is normal to a trigonal symmetry axis	2
278.	" 495.	Octahedron, extended in the direction of a line between two opposite edges, that is in the direction of a rhombic interaxis	2
279.	" 496.	Dodecahedron elongated in the direction of a trigonal symmetry axis, resembling combination of hexagonal prism and rhombohedron	2
280.	" 497.	Dodecahedron shortened in the direction of a trigonal symmetry axis, resembling combination of a rhombohedron and a hexagonal prism	2
281.	" 498.	Dodecahedron, lengthened in the direction of one of the cubic axis and becoming a square prism with pyramidal summits, resembling zircon	2
282.	" 499.	Dodecahedron, shortened in the direction of one of the cubic axis is reduced to a square octahedron with truncated basal angles, resembling zircon	2

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For smaller collections see next page !

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The different DANA - sets.

DANA set no. 1: 1 - 192 = 192 models.

DANA set no. 2: 1 - 13, 16, 19, 21, 22, 24, 26, 27, 30, 32,  
33, 34, 36 - 41, 43, 45 - 48, 50 - 53, 56 - 66,  
68, 71 - 76, 78 - 80, 86, 87, 89, 90, 92, 95,  
96 - 99, 101, 102, 106, 107, 108, 109, 111, 112, 114,  
117, 118, 121, 124 - 126, 130, 133, 134, 136, 137, 138,  
139 - 144, 146 - 147, 149 - 153, 155 - 165, 167, 169, 170,  
171, 172, 174 - 181, 184, 186, 187, 189 - 192 =  
135 models.

DANA set no. 3: 1 - 4, 6, 8, 10, 11, 13, 16, 19, 21, 22,  
27, 30, 33, 34, 36, 39, 43, 46, 47, 50 - 53,  
61 - 66, 68, 71, 74 - 76, 78, 79, 86, 90, 92,  
96, 98, 99, 101, 102, 106, 108, 109, 111, 112, 114,  
117 - 118, 124 - 126, 133, 136, 137, 141 - 144, 146, 147,  
149 - 151, 153, 157, 159, 162 - 165, 167, 169, 170 - 172,  
174 - 177, 179 - 181, 184, 186, 187, 189 - 192 =  
96 models.

DANA set no. 4: 1 - 4, 8, 10, 11, 13, 19, 22, 27, 30, 34,  
36, 39, 43, 47, 50 - 54, 61, 62, 64 - 66, 68,  
71, 75, 78, 86, 90, 92, 96 - 98, 99 - 102, 106,  
109, 112, 114, 117, 124, 125, 133, 137, 141, 143, 144,  
146, 147, 149 - 151, 153, 155, 162 - 164, 167, 169, 170,  
171, 172, 174, 176, 179 - 181, 186, 187, 189, 190, 192  
= 78 models.

DANA set no. 5: 193 - 282 = 80 models of twin and distorted crystals.

DANA set no. 6: 195, 196, 207, 215, 217, 218, 223, 224, 230, 232, 233,  
236, 239, 241, 243, 250, 252, 255, 256, 257, 258, 260,  
267, 269, 273, 277, 278, 279, 280, 281 =  
30 models.

DANA set no. 7: 1 - 282 = 282 models.

All models may be purchased separately !



