THE COMPENDIUM INDEX OF NORTH AMERICAN MESOZOIC AND CENOZOIC TYPE FOSSIL PLANTS

The Compendium Index (CI) is a one-of-a-kind card catalog that contains illustrations and descriptions of fossil plant species. The CI facilitates identification of fossil plants by arranging these cards into a unique set of numbered morphological categories (e.g., leaf shape and major venation type) that group like-forms with one another regardless of their professed taxonomic assignments.

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User's Guide

1. Introduction and Description of fields

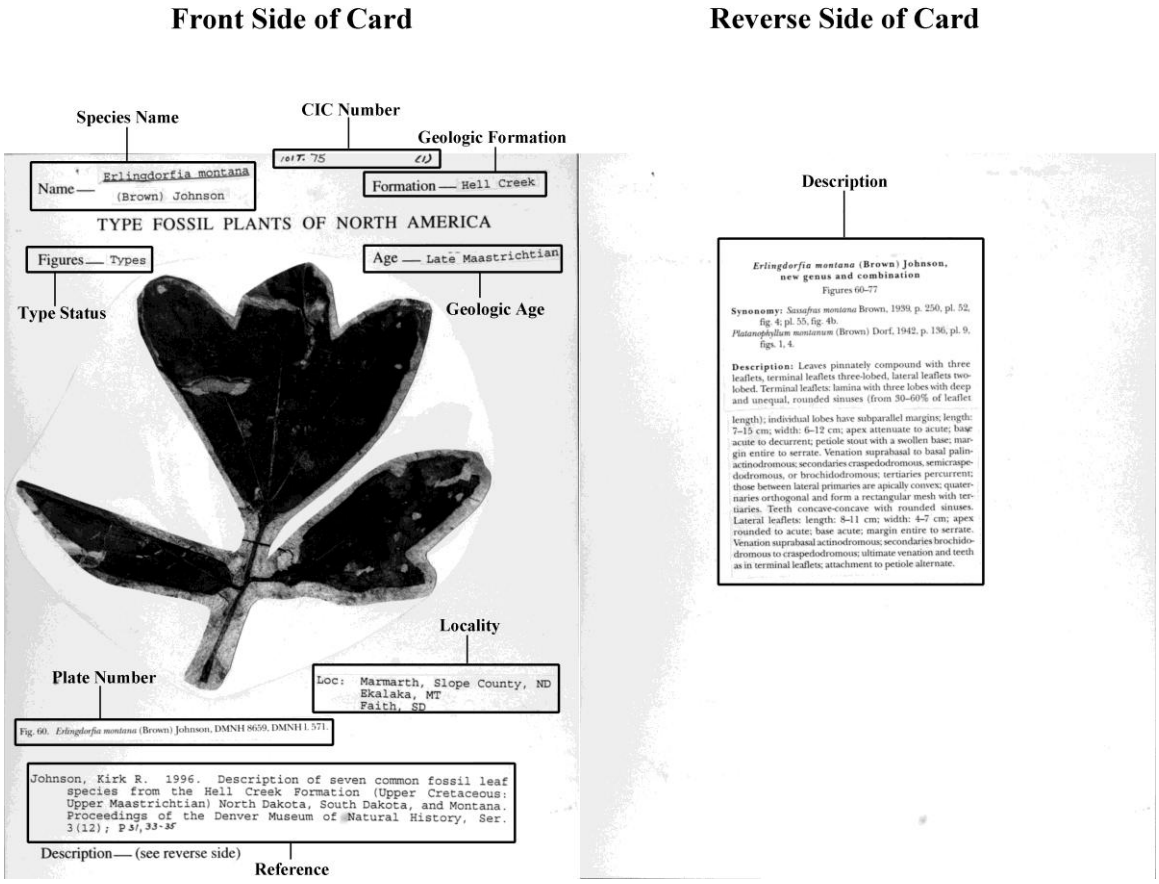


Figure 1. Obverse and reverse sides of the card illustrating *Erlingdorfia montana* (Brown) Johnson, with the categories to be explained below.

Figure 1 shows the front and back sides of a typical card-entry in the Compendium Index. Each front bears the title line of the Compendium Index at top center. Sometimes, as in this example, the title line appears below the first set of identifiers. This is followed by:

CIC Number. (Center) In this case the entry is 101T.75(1). This number is made up of a Compendium Index Category (CIC) number (101) that denotes a morphological category of an organ of a plant taxon (pinnately compound, untoothed, dicotyledonous angiosperm leaf). This is followed by an upper-case letter that designates the epoch of the Triassic and Jurassic Periods and of the Cenozoic Era, and the ages of the Cretaceous Period from which the material shown on the card is derived (in this case the Maastrichtian Age, signified by the letter T). The decimal number that concludes the string indicates its placement within the age-designated

compendium index category, here 101T. In general the catalogue is organized so that the most typical morphologies of an age-designated CIC fall in the middle of the numerical range, with the extremes given at the upper and lower limits of the range. See pages 3-13 for details relating to the CIC number, and page 14 for the geologic age values. The final entry for this example of a CIC number, (1), indicates that this is the first of several cards for this entry. This is left blank for single cards.

Species Name. (Top left) The full species name, including its author(s).

Formation. (Top right) The geological formation or sometimes the flora name.

Type Status. (Next line left) An indication of the designation of the illustrated material on the card as nomenclatural types or figured specimens, including holotype, lectotype, paratypes or other secondary types, and figured specimens.

Age. (Right) Geological epoch or age designation, sometimes more closely specified, as here to "late Maastrichtian."

Plate number. (Below the figures, left) Includes designation of both the plate(s) and figure(s) represented by the illustrations on the card.

Locality. (Below the figures, right) Often abbreviated as "Loc". The geographic position, to a greater or lesser degree of resolution.

Reference. The full or abbreviated citation appears above the designation **Description**, which carries the reader to the reverse side of the card.

On the reverse side of the card the name and author(s) of the entry are repeated, sometimes with a synonomy, followed by the description, discussion, type designations, and locality data, although the latter categories are not uniformly represented, especially in the older literature. Hand written notes may also appear on some cards.

The face of each of the cards may be retrieved by typing its CIC number and the reverse side by adding the designation "rev". If more than one card exists for an entry, these can be accessed using the suffix (1), (2), (3), etc. after the CIC number. Each of the categories designated in bold-face above may also be searched and will produce an aggregate list of relevant files. The first two components of the CIC number, i.e. 101 and T, may also be searched.

Details for generating the CIC numbers

The first three digits in the CIC field represent a category number generated in successive-integer columns that are organized with the hundred's column representing major taxonomic categories,

such as angiosperms (100's) and gymnosperms (200's), followed by specific organ-types and their morphology in the 10's and unit columns. Thus:

1-- **ANGIOSPERMS**

Leaves with several orders of venation, cross-veins and vein anastamoses at several orders.

Leaves Preserving Compound Attachment

100 Leaf pinnately compound or (bi-) trifoliate, toothed
101 Leaf pinnately compound or (bi-) trifoliate, toothless
102 Leaf palmately compound

Leaves Preserved as Isolated Lamina

Petiole Attached at the Base of the Lamina

103 Lamina pinnately veined, deeply emarginate, or bilobed or in multiples of 2
104 Lamina pinnately veined, 3 or more lobes
105 Lamina pinnately veined, linear
106 Lamina pinnately veined, unlobed, oblong, toothed
107 Lamina pinnately veined, unlobed, oblong, toothless,
108 Lamina pinnately veined, unlobed, elliptic, symmetrical, dentate
109 Lamina pinnately veined, unlobed, elliptic, symmetrical, serrate
110 Lamina pinnately veined, unlobed, elliptic, symmetrical, crenate
111 Lamina pinnately veined, unlobed, elliptic, symmetrical, toothless
112 Lamina pinnately veined, unlobed, elliptic, asymmetrical
113 Lamina pinnately veined, unlobed, ovate, symmetrical, dentate
114 Lamina pinnately veined, unlobed, ovate, symmetrical, serrate
115 Lamina pinnately veined, unlobed, ovate, symmetrical, crenate
116 Lamina pinnately veined, unlobed, ovate, symmetrical, toothless, secondaries with uniform spacing and angle of origin
117 Lamina pinnately veined, unlobed, ovate, symmetrical, toothless, secondaries crowded toward the base
118 Lamina pinnately veined, unlobed, ovate, symmetrical, toothless, one or more pairs of lower secondaries emerging at a lower angle than those above
119 Lamina pinnately veined, unlobed, ovate, symmetrical, toothless, With (an) intramarginal vein(s)
120 Lamina pinnately veined, unlobed, ovate, asymmetrical
121 Lamina pinnately veined, unlobed, obovate, symmetrical, toothed

122 Lamina pinnately veined, unlobed, obovate, symmetrical, toothless
123 Lamina pinnately veined, unlobed, obovate, asymmetrical
124 Lamina pinnately veined, with a pectinal vein, unlobed, elliptic or oblong, toothed
125 Lamina pinnately veined, with a pectinal vein, unlobed, elliptic or oblong, toothless
126 Lamina pinnately veined, with a pectinal vein, unlobed, ovate, toothed
127 Lamina pinnately veined, with a pectinal vein, unlobed, ovate, toothless
128 Lamina pinnately veined, with a pectinal vein, unlobed, obovate
129 Lamina acrodromously veined, elliptic, or oblong, toothed
130 Lamina acrodromously veined, elliptic or oblong, toothless
131 Lamina acrodromously veined, ovate, toothed
132 Lamina acrodromously veined, ovate, toothless
133 Lamina acrodromously veined, obovate
134 Lamina actinodromously or palinactinodromously veined, unlobed, elliptic, or oblong, toothed
135 Lamina actinodromously or palinactinodromously veined, unlobed, elliptic, or oblong, toothless
136 Lamina actinodromously or palinactinodromously veined, unlobed, ovate, toothed
137 Lamina actinodromously or palinactinodromously veined, unlobed, ovate, toothless
138 Lamina actinodromously or palinactinodromously veined, unlobed, obovate
139 Lamina actinodromously or palinactinodromously veined, 2-lobed or lobes in multiples of 2
140 Lamina actinodromously or questionably palinactinodromously veined, 3-lobed
141 Lamina actinodromously or questionably palinactinodromously veined, with 5 or more lobes
142 Lamina definitely palinactinodromously veined, 3-lobed
143 Lamina definitely palinactinodromously veined, 5 or more lobes
144 Lamina campylodromously veined
145 Lamina flabellately veined or very weakly pinnately veined
146 Lamina flat and unlobed, veins penni-parallelodromous, pinnately attached to a costa
147 Lamina flat and unlobed, veins parallelodromous from a zone at the blade base
148 Lamina plicate or breaking into narrow-segments, venation parallelodromous, leaf shape and vein origin unknown
149 Lamina plicate and lobed, fan-shaped, venation palmate
150 Lamina plicate and lobed, feather-shaped, venation pinnate

Petiole Attached Inside the Leaf Margin

151 Lamina pinnately veined, with or without agrophic veins
152 Lamina palmately veined, unlobed, orbicular
153 Lamina palmately veined, unlobed, ovate, toothed
154 Lamina palmately veined, unlobed, ovate, toothless
155 Lamina palmately veined, lobed

Petiole Attachment Various or Indeterminate

160 Lamina of special or unusual shape (including needle, awl and scale)
161 Lamina insufficiently characterized, pinnate (or unknown), toothed
162 Lamina insufficiently characterized, pinnate (or unknown), toothless (or unknown)
163 Lamina insufficiently characterized, palmate, toothed
164 Lamina insufficiently characterized, palmate, toothless (or unknown)
165 Lamina with unusal vein pattern, bifid or other

Other Organs

170 Flowers occurring as single units
171 Flowers aggregated into catkins or aments
172 Flowers aggregated in heads or capitulas
180 Fruits, dry, indehiscent, seed-containing portion relatively small (generally <5mm) or, if winged, the winged portion exceeding the size of the seed (achenes, caryopsis, utricles, cypselas, samaras, etc.)
181 Fruits, dry, indehiscent, large (>5mm) or, if winged, the winged portion smaller than the seed bearing portion (acorns, balaustas, calybiums, nuts)
182 Fruits, dry, dehiscent (capsules, follicles, or siliques)
183 Fruits, dry, dehiscent (legumes or loments)
184 Fruits, fleshy (berries, drupes, pomes, etc.)
185 Fruits, aggregate or multiple
186 Fruits, otherwise or of indeterminate characters
190 Wood or stems

2-- GYMNOSPERMS

200 Pteriodosperms (including Caytoniales)
210 Cycadophytes, leaves dissected, toothless, veins parallel except convergent at pinnule apex and base, mainly forked
211 Cycadophytes, leaves dissected, toothless, veins parallel except convergent at the pinnule apex and base, mainly unforked, pinnules <3cm long
212 Cycadophytes, leaves dissected, toothless, veins parallel except convergent at the pinnule apex and base, mainly unforked, pinnules >3cm long

213 Cycadophytes, leaves dissected, toothless, veins pinnate or radiating throughout length of pinnule
214 Cycadophytes, leaves dissected, pinnules toothed
215 Cycadophytes, leaves undissected, veins parallel, unforked
216 Cycadophytes, leaves undissected, veins parallel, forked
217 Cycadophytes, leaves of indeterminable habit
218 Cycadophytes, seeds, cones and "flowers"
219 Cycadophytes, stems and wood
220 Ginkgophytes, leaves fan-shaped, veins flabellate, includes the Noeggerathiales and Czekanowskiales
230 Conifers, scaly foliage, leaves appressed to stem for more than ½ of their length
231 Conifers, short needles: average <3cm
232 Conifers, long needles: average >3cm
233 Conifers, leafy blades: 1ength <3mm, 1/w ratio >10:1 or 1ength>3mm, 1/w ratio 1.5 or less
234 Conifers, cones
235 Conifers, cone scales
236 Conifers, seeds
237 Conifers, wood
238 Conifers, characters uncertain
240 Gnetophytes

300 ALGAE

350 FUNGI

400 BRYOPHYTES

5-- FERNS

500 Blades dissected, veins open, ultimate laminar division with no midribs
501 Blades dissected, veins open, ultimate laminar division with midribs, veins unforked
502 Blades dissected, veins open, ultimate laminar divisions with midribs, veins forked
503 Blades dissected, veins closed, ultimate laminar divisions with no midribs
504 Blades dissected, veins closed, ultimate laminar divisions with midribs
505 Blades undissected
506 Venation obscure or uncertain
507 Specialized fertile pinnae, fertile part much exceeding the amount of sterile tissue in at least a part of the leaf
508 Fern stems and rhizomes
509 Fragments too small to determine

600 SPHENOPSIDS

7-- LYCOPSIDS

700 *Lycopodium* and *Selaginella*
710 Isoetales

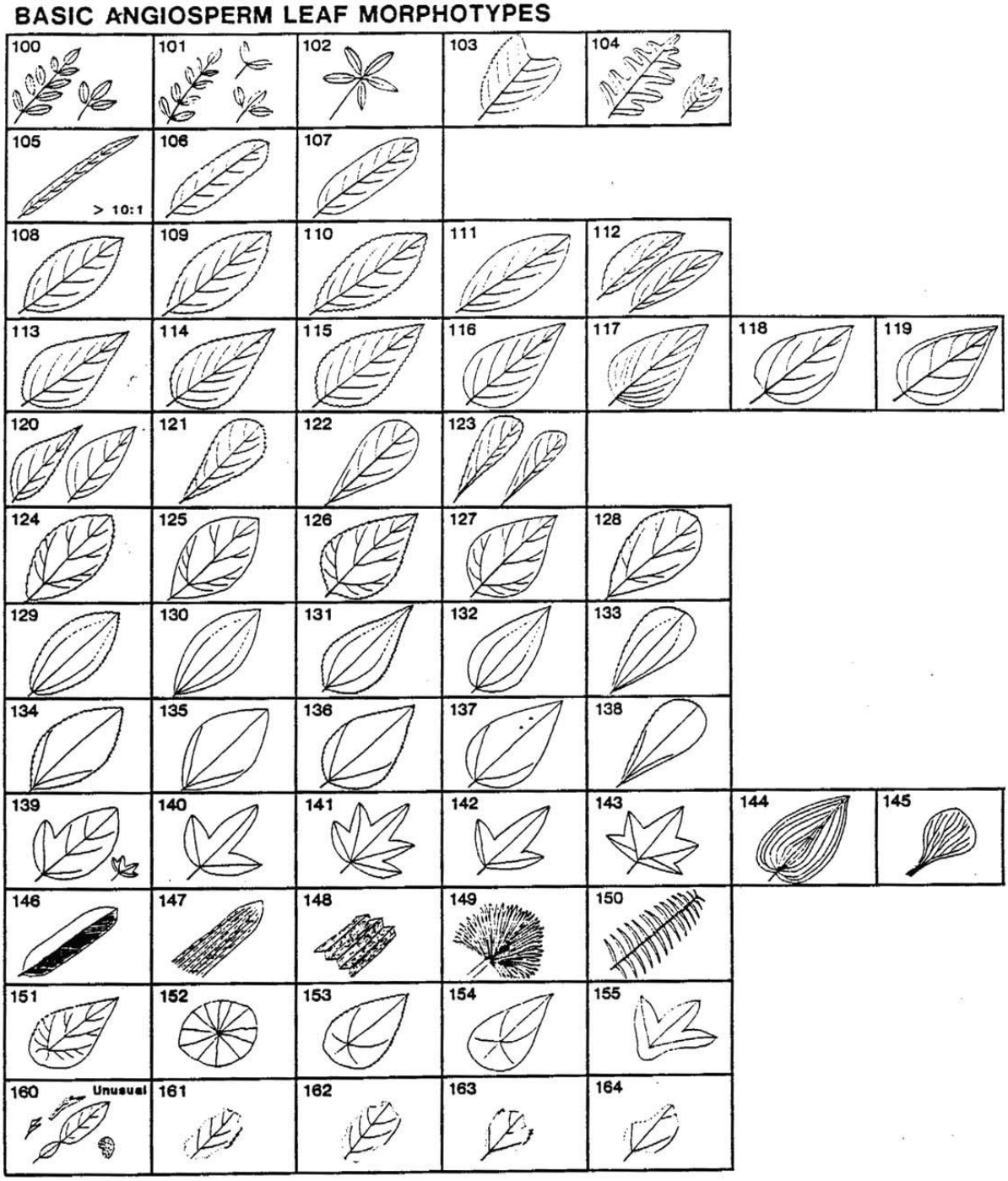
800 GALLS

9-- PLANTS OF INDETERMINATE RELATIONSHIPS

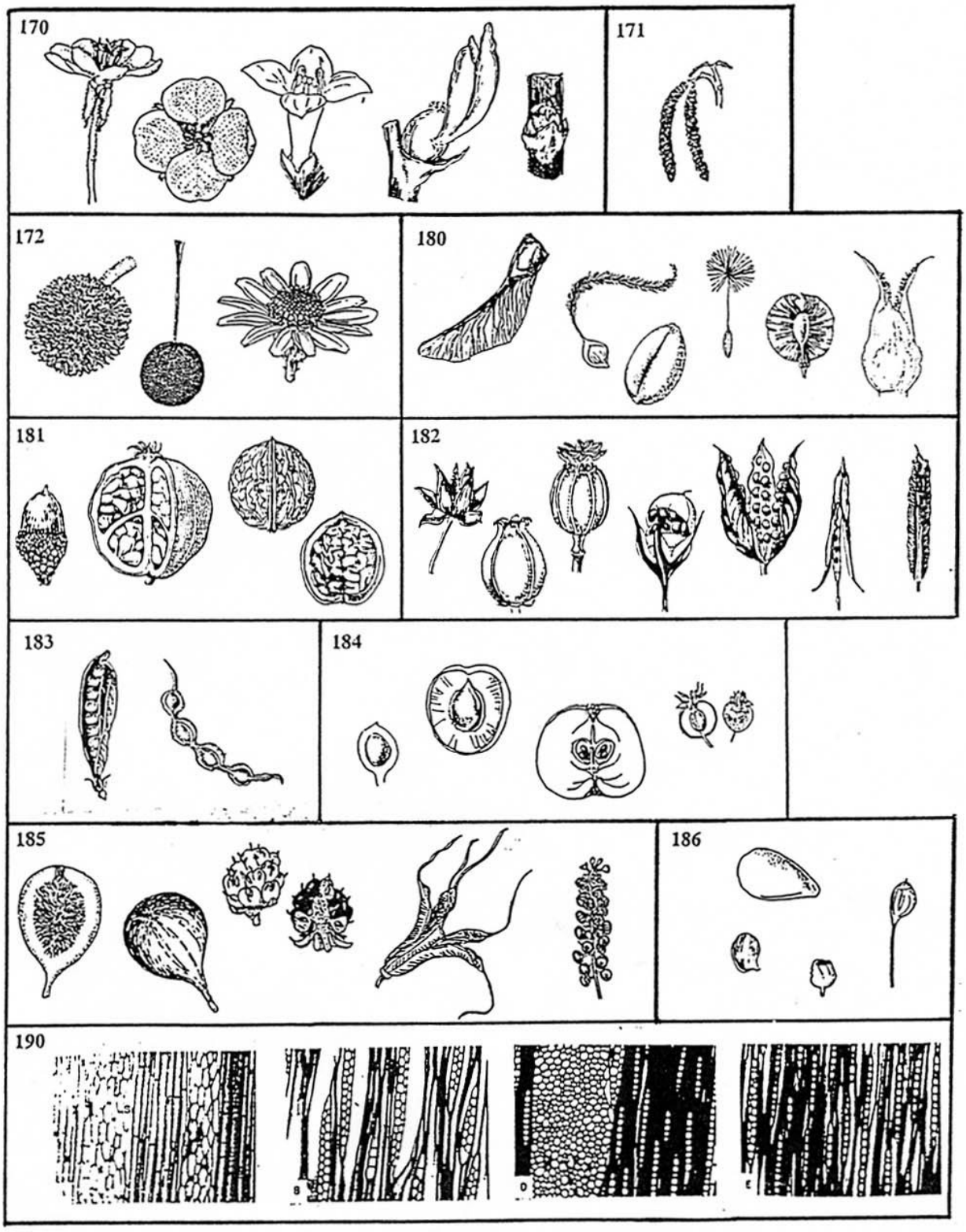
900 Stems with attached leaves or other structures
910 Rhizomes, roots and stems
920 Leaves
930 Seeds
940 Miscellaneous plant organs and parts
950 Indeterminate plant parts
990 NON-PLANTS

A set of images (Figure 2) illustrating all of these Compendium Index Categories appear on pages 9-13 of this Guide and an illustrated dichotomous key on pages 33-36.

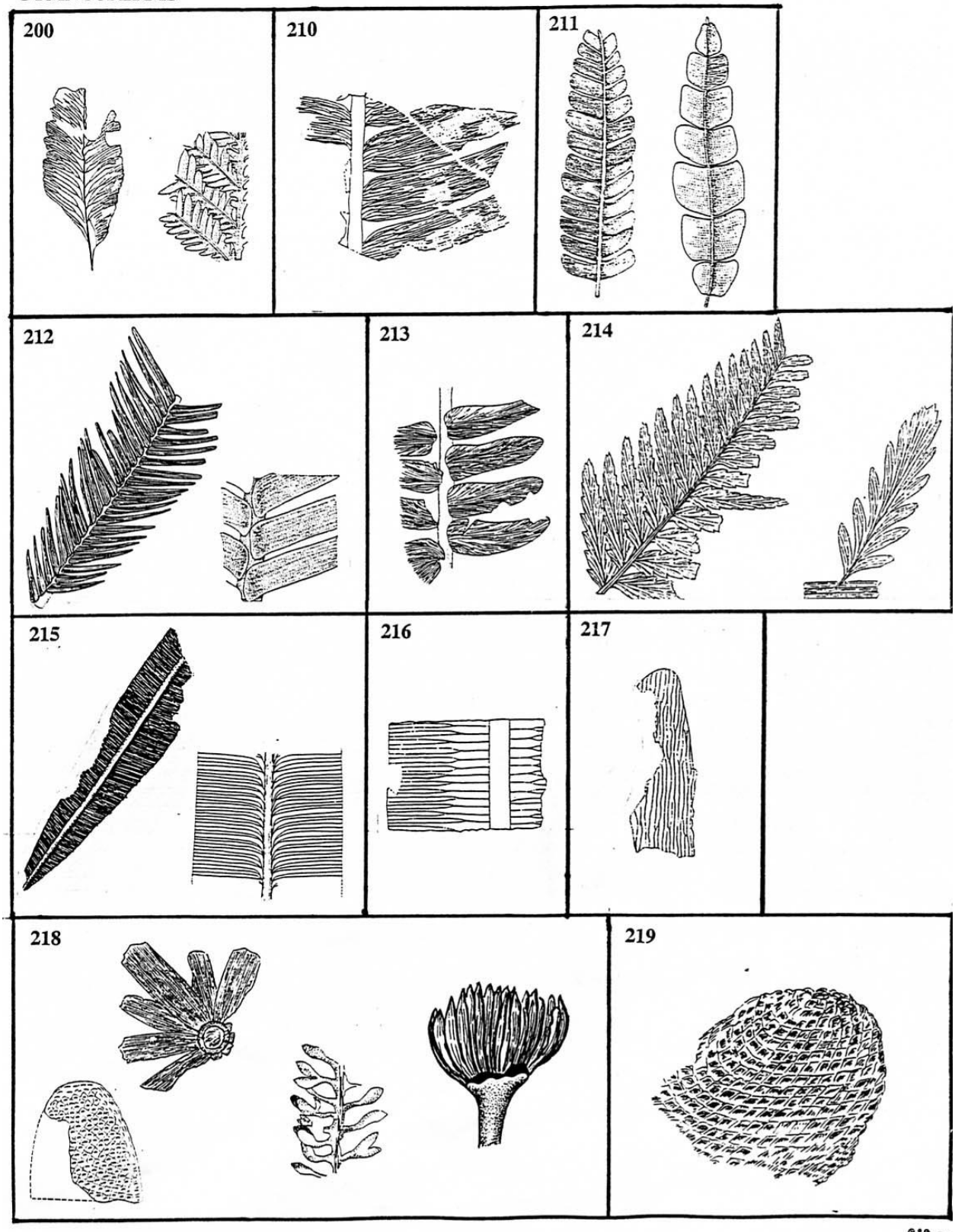
Figure 2. Images



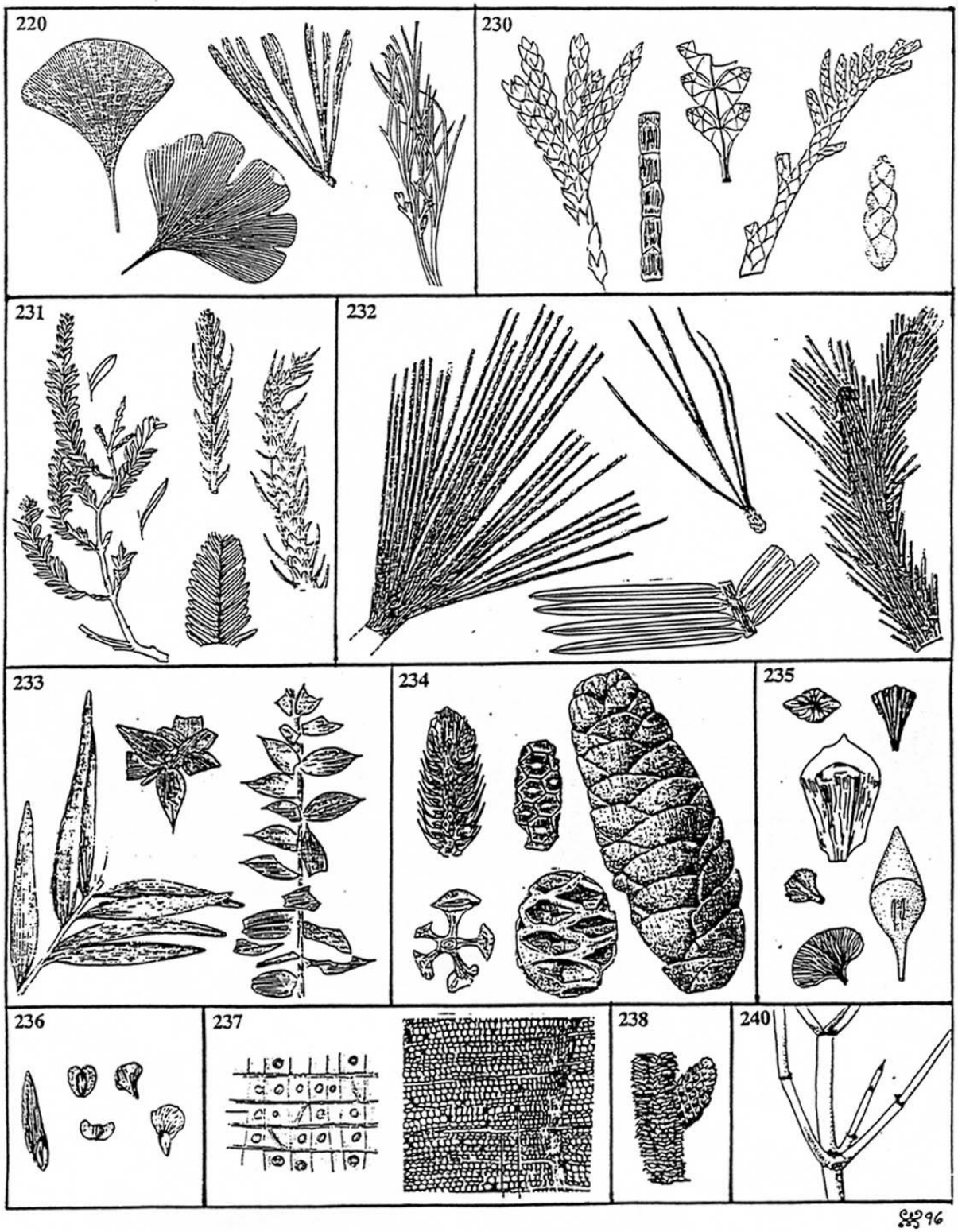
ANGIOSPERMS; OTHER ORGANS



GYMNOSPERMS



GYMNOSPERMS (cont.)



ALGAE

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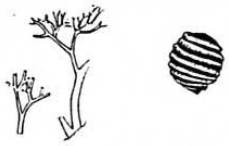
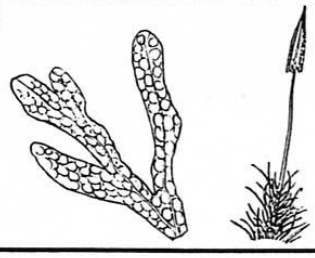


FUNGI

350

BRYOPHYTES

400



FERNS

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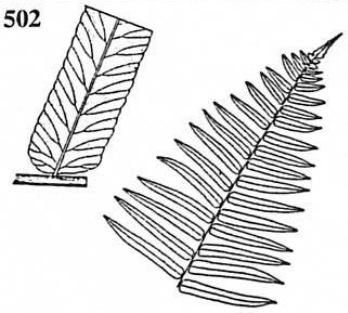

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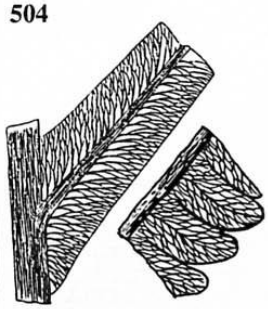

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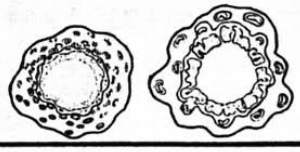

509

SPHENOPSIDS

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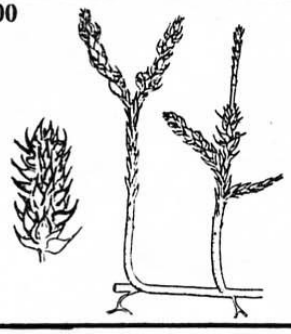
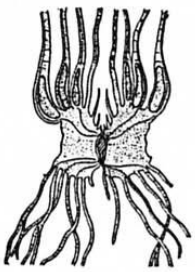
LYCOPSIDS

700



GALLS

710



800

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900's

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Details for generating the age designation

The fourth character of the CIC number is an upper-case letter that reflects the geological age of the illustrated material, as follows:

CENOZOIC	
Quaternary	
Pleistocene	Z
Tertiary	
Pliocene	Y
Miocene	X
Oligocene	W
Eocene	V
Paleocene	U
MESOZOIC	
Cretaceous – Late	
Maastrichtian	T
Campanian	S
Santonian	R
Coniacian	Q
Turonian	P
Cenomanian	N
Cretaceous – Early	
Albian	M
Aptian	L
Barremian	K
Neocomian	J
Jurassic – Late	I
Jurassic – Middle	H
Jurassic – Early	G
Triassic - Late	F
Triassic – Middle	E
Triassic – Early	D

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The complete list of references with their serial numbers, are given in alphabetic order by author in the list below.

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Appendix. Dichotomous Keys for all Morphotypes

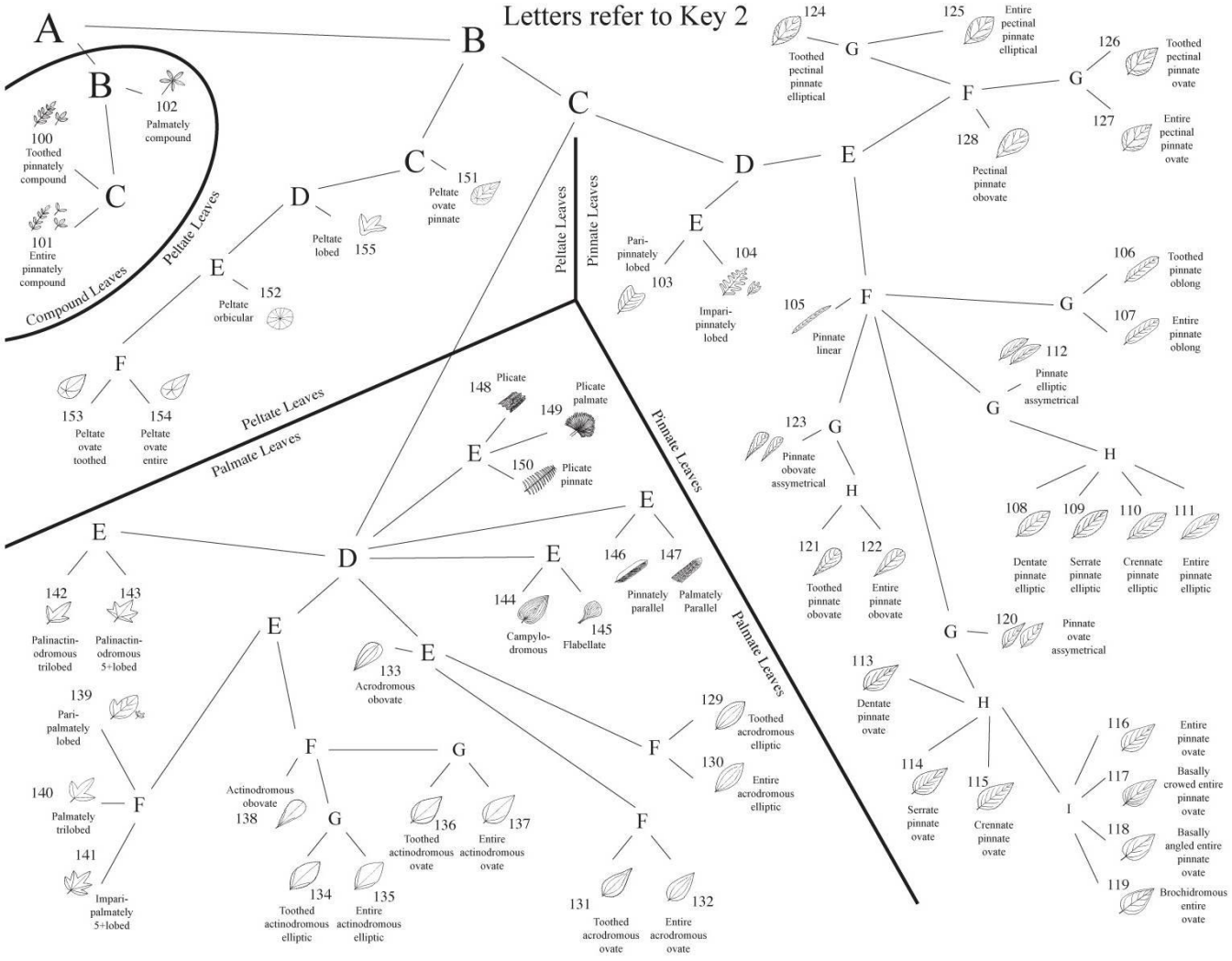
The following keys and their descriptive captions are derived from appendices in: Green, W.A and Hickey, L.J. 2005. Leaf architectural profiles of angiosperm floras across the Cretaceous/Tertiary Boundary. American Journal of Science 305:983-1013.

KEY 1: Presumed Plant Fossils **CIC**

A. Angiosperm 1—
B. Leaf reasonably complete **see Key 2** 100–155
B′. Leaf shape unusual or indeterminate 16–
C. Lamina of unusual shape 160
C. Pinnately veined or indeterminate
D. Toothed 161
D′. Entire or indeterminate 162
C. Palmately veined
D. Toothed 163
D′. Entire or indeterminate 164
B″. Flower or inflorescence 17–
C. Single flower 170
C′. Catkin/ament 171
C″. Head/capitulum 172
B‴. Fruit or infructescence 18–
C. Single fruit, dry
D. Indehiscent
E. Small 180
E′. Large 181
D′. Dehiscent
E. Capsule, follicule, silique 182
E′. Legume, loment 183
C′. Single fruit, fleshy (berry, drupe, pome) 184
C″. Infructescence 185
C‴. Indeterminate fruiting structure 186
B⁗. Wood/axis 19– 190
A′. Gymnosperm 2—
B. Pteridosperm (including Caytoniales) 200
B′. Cycadophyte 21–
C. Leaf
D. Dissected
E. Pinnules entire 210
F. Veins parallel in pinnule
G. Pinnule <3 cm long 211
G′. Pinnule >3 cm long 212
F′. Veins pinnate in pinnule 213
E′. Pinnules with teeth 214
D′. Undissected
E. Veins unforked 215
E′. Veins forked 216
D″. Indeterminate 217
C′. Seed, cone, or flower 218
C″. Wood or stem 219
B″. Ginkgophyte 22– 220
B‴. Conifer 23–
C. Foliage
D. Scaley 230
D′. Needles <3 cm long 231
D″. Needles >3 cm long 232
D‴. Needles flattened 233
C′. Reproductive structure
D. Cone 234
D′. Cone scale 235
D″. Seed 236
C″. Wood 237
C‴. Indeterminate 238
B⁗. Gnetophyte 240
A″. Alga or fungus 3—
B. Alga 300
B′. Fungus 350
A‴. Bryophyte 4— 400
A⁗. Fern 5—
B. Leaf with sterile tissue dominant
C. Blades dissected
D. Ultimate laminar divisions without midribs
E. Veins open
F. Veins forked 500
F′. Veins unforked 501
E′. Veins closed
F. Veins forked 502
F′. Veins unforked 503
D′. Ultimate laminar divisions with midribs 504
C′. Blades undissected 505
C′. Indeterminate fragments 506
B′. Leaf with fertile tissue dominant 507
B″. Stem or rhizome 508
B‴. Indeterminate fragments 509
A⁗⁗. Sphenopsid 6—
A⁗⁗⁗. Lycopod 7—
B Lycopodium or Selaginella 70– 700
B′. Isoetales 71– 710
A⁗⁗⁗⁗. Gall or Lesion 8— 800
A⁗⁗⁗⁗⁗. Indeterminate 9—
B′. Stem or axis with attachments 900
B″. Rhizome, root, or detached axis 910
B‴. Leaf 920
B⁗. Seed 930
B⁗⁗. Other organ 940
B⁗⁗⁗. Indeterminate; probably plant 950
B⁗⁗⁗⁗. Indeterminate; probably not plant 990

KEY 2: Angiosperm Leaves **CIC**

A. Leaf Compound
B. Pinnately compound
C. Toothed 100
C′. Entire 101
B′. Palmately compound 102
A′. Leaf simple
B. Petiole marginally attached
C. Veination pinnate
D. Lobed
E. Even number of lobes 103
E′. Odd number of lobes 104
D′. Unlobed
E. Pectinal absent
F. Shape linear 105
F′. Shape oblong
G. Toothed 106
G′. Entire 107
F″. Shape elliptic
G. Symmetrical
H. Teeth dentate 108
H′. Teeth serrate 109
H″. Teeth crenate 110
H‴. Entire 111
G′. Assymetrical 112
F‴. Shape ovate
G. Symmetrical
H. Teeth dentate 113
H′. Teeth serrate 114
H″. Teeth crenate 115
H‴. Entire
I. Secondaries uniform 116
I′. Secondaries crowded towards base 117
I″. Basal secondaries lower angle 118
I‴. Intramarginal present 119
G′. Assymetrical 120
F⁗. Shape obovate
G. Symmetrical
H. Toothed 121
H′. Entire 122
G′. Assymetrical 123
E′. Pectinal present
F. Shape elliptic or oblong
G. Toothed 124
G′. Entire 125
F′. Shape ovate
G. Toothed 126
G′. Entire 127
F″. Shape obovate 128
C′. Veination palmate
D. Veination acrodromous
F. Shape elliptic
G. Toothed 129
G′. Entire 130
F′. Shape ovate
G. Toothed 131
G′. Entire 132
F″. Shape obovate 133
D′. Veination actinodromous or indeterminate
E. Unlobed
F. Shape elliptic
G. Toothed 134
G′. Entire 135
F′. Shape ovate
G. Toothed 136
G′. Entire 137
F″. Shape obovate 138
E′. Lobed
F. Paripalmately lobed 139
F′. Trilobed 140
F″. 5+ lobed 141
D″. Veination palinactinodromous
E. Trilobed 142
E′. 5+ lobed 143
D‴. Veination campylodromous 144
D⁗. Veination flabellate 145
D⁗′. Veination parallelodromous
E. Pinnately parallelodromous 146
E′. Parallel from base 147
D⁗″. Veination plicate
E. Leaf shape uncertain 148
E′. Leaf palmate 149
E″. Leaf palmate 150
B′. Petiole attached centrally
C. Veination pinnate 151
C′. Veination palmate
D. Unlobed
E. Shape orbicular 152
E′. Shape ovate
F. Toothed 153
F′. Entire 154
D′. Lobed 155


Letters refer to Key 2
Compound Leaves
Peltate Leaves
Palmate Leaves
Pinnate Leaves
Peltate Leaves
Pinnate Leaves
Peltate Leaves
Palmate Leaves
Pinnate Leaves
Palmate Leaves
100 Toothed pinnately compound
101 Entire pinnately compound
102 Palmately compound
151 Peltate ovate pinnate
Peltate lobed
155
152 Peltate orbicular
153 Peltate ovate toothed
154 Peltate ovate entire
148 Plicate
149 Plicate palmate
150 Plicate pinnate
142 Palinactin-odromous trilobed
143 Palinactin-odromous 5+lobed
139 Pari-palmately lobed
140 Palmately trilobed
141 Impari-palmately 5+lobed
Actinodromous obovate
138
134 Toothed actinodromous elliptic
135 Entire actinodromous elliptic
136 Toothed actinodromous ovate
137 Entire actinodromous ovate
133 Acrodromous obovate
144 Campylo-dromous
145 Flabellate
146 Pinnately parallel
147 Palmately Parallel
131 Toothed acrodromous ovate
132 Entire acrodromous ovate
129 Toothed acrodromous elliptic
130 Entire acrodromous elliptic
Pari-pinnately lobed
103
104 Impari-pinnately lobed
105 Pinnate linear
123 Pinnate obovate assymetrical
121 Toothed pinnate obovate
122 Entire pinnate obovate
124 Toothed pectinal pinnate elliptical
125 Entire pectinal pinnate elliptical
126 Toothed pectinal pinnate ovate
127 Entire pectinal pinnate ovate
128 Pectinal pinnate obovate
106 Toothed pinnate oblong
107 Entire pinnate oblong
112 Pinnate elliptic assymetrical
120 Pinnate ovate assymetrical
113 Dentate pinnate ovate
114 Serrate pinnate ovate
115 Crennate pinnate ovate
108 Dentate pinnate elliptic
109 Serrate pinnate elliptic
110 Crennate pinnate elliptic
111 Entire pinnate elliptic
116 Entire pinnate ovate
117 Basally crowed entire pinnate ovate
118 Basally angled entire pinnate ovate
119 Brochidromous entire ovate