Supplementary Table 4 **A list of all unambiguously optimized character state changes for the phylogeny of basal ornithischian relationships.** Nodes numbers refer to those labeled above the nodes in Figure 2. For each character change listed below, the character number is given followed by the CI for that character and the specific state change observed at that branch or internode.

Node 2🡪 Node 54

225 1.00 0 → 1Node 53 🡪*Silesaurus opolensis*

47 0.50 2 → 1148 0.43 0 → 1151 0.33 0 → 1

Node 53 🡪*Asilisaurus kongwe*

207 0.17 0 → 1219 1.00 1 → 0

Node 2 🡪 Node 3

184 0.25 0 → 1199 1.00 0 → 1230 1.00 0 → 1 237 1.00 0 → 1

 Node 3 🡪Node 52

120 0.20 0 → 1133 0.33 0 → 1205 0.20 0 → 1211 0.25 0 → 1

Node 52 🡪 Node 53

183 0.33 0 → 1229 1.00 1 → 0

Node 52 🡪*Tawa hallae*

56 0.33 0 → 1 88 0.33 0 → 1 112 0.29 1 → 2 179 0.50 0 → 1Node 3 🡪 Node 4

19 1.00 0 → 1 80 1.00 0 → 1

 82 1.00 0 → 1 117 0.40 0 → 1 131 0.50 0 → 1 236 0.33 2 → 0Node 4 🡪*Pisanosaurus mertii*

127 0.14 0 → 1Node 4 🡪 Node 5 200 0.14 1 → 0 229 1.00 1 → 2Node 5 🡪 Node 48

183 0.33 0 → 1Node 48 🡪 Node 49

77 0.25 0 → 1Node 49 🡪 Node 50

 134 1.00 0 → 1 Node 50 🡪 Node 51

 113 1.00 0 → 1 148 0.43 1 → 2 214 0.20 0 → 1 217 0.50 1 → 2Node 51 🡪*Heterodontosaurus tucki*

 15 0.33 1 → 0 16 0.20 0 → 1 38 0.50 0 → 3 68 0.33 1 → 0 117 0.40 1 → 2 120 0.20 0 → 1 121 0.20 0 → 1 127 0.14 0 → 1 128 0.17 0 → 1 129 0.25 0 → 1 130 0.25 1 → 0 133 0.33 0 → 1 139 0.17 0 → 1 168 0.25 0 → 1 202 0.20 1 → 0 207 0.17 0 → 1 Node 51 🡪*Fruitadens haagarorum*

 18 0.50 0 → 1 116 0.50 1 → 0Node 51 🡪*Tianyulong confuciusi*

 75 0.14 0 → 1 83 0.25 0 → 1 167 0.17 0 → 1 222 0.17 0 → 1 250 0.25 0 → 1 Node 5 🡪 Node 6

 12 0.25 0 → 1 18 0.50 0 → 1 71 1.00 0 → 1

 73 1.00 0 → 1 109 0.25 2 → 1 116 0.50 1 → 0 137 0.22 1 → 2 147 0.50 0 → 1 240 0.50 0 → 1Node 6 🡪 Node 45

 52 0.50 1 → 0 86 0.67 0 → 1 112 0.29 1 → 0 122 0.67 1 → 0 131 0.50 1 → 0Node 45 🡪*Lesothosaurus diagnosticus*

 21 0.50 0 → 1 118 0.33 0 → 1 184 0.25 1 → 0 234 0.60 0 → 3Node 45 🡪 Node 46

 32 1.00 0 → 1 253 1.00 0 → 1Node 46 🡪 Node 47

 8 0.33 1 → 0 78 1.00 0 → 1Node 46 🡪*Scelidosaurus harrisonii*

 254 1.00 0 → 1Node 6 🡪 Node 7

 190 1.00 0 → 1 203 0.33 0 → 1Node 7 🡪*Stormbergia dangershoeki*

 169 0.22 0 → 1 172 0.50 0 → 1 206 0.17 0 → 1 227 0.14 1 → 0Node 7 🡪 Node 8

 145 0.50 0 → 1 192 1.00 0 → 1 197 0.43 0 → 2 198 0.50 0 → 1Node 8 🡪*Agilisaurus louderbacki*

 5 0.40 0 → 1 8 0.33 1 → 0 23 0.50 1 → 2 25 0.20 1 → 0 27 0.50 0 → 1 28 0.25 0 → 1 29 0.29 1 → 0 45 0.20 0 → 1 77 0.25 0 → 1 142 0.33 0 → 1 182 0.33 0 → 1 195 0.40 0 → 1Node 8 🡪 Node 9

 57 0.25 0 → 1 183 0.33 0 → 1 184 0.25 1 → 0 189 0.50 0 → 1 202 0.20 1 → 0 232 0.56 0 → 1Node 9🡪*Hexinlusaurus multidens*

 34 0.13 1 → 0 210 0.20 0 → 1 216 0.33 1 → 0 245 0.40 0 → 1Node 9 🡪*Yandusaurus hongheensis*

 159 0.50 0 → 1 160 0.40 1 → 0Node 9 🡪*Leaellynasaura amicagraphica*

 121 0.20 0 → 1 128 0.17 0 → 1 197 0.43 2 → 3 214 0.20 0 → 1Node 9 🡪 Node 10

 114 0.20 0 → 1 137 0.22 2 → 1 148 0.43 1 → 2 191 0.50 0 → 1 212 1.00 0 → 1 218 0.50 0 → 1 238 0.20 0 → 1Node 10 🡪 Node 44

 167 0.17 1 → 0Node 44 🡪*Jeholosaurus shangyuanensis*

 209 0.20 0 → 1Node 44 🡪*Yueosaurus tiantaiensis*

 169 0.22 0 → 2Node 10 🡪 Node 11

 152 0.25 0 → 1 210 0.20 0 → 1 227 0.14 1 → 0Node 11 🡪*Othnielosaurus consors*

 74 0.38 2 → 1 99 0.25 0 → 1 105 0.20 1 → 0 108 0.40 0 → 1 157 0.33 0 → 1 201 0.40 0 → 1 234 0.60 0 → 2 235 0.50 0 → 1Node 11 🡪 Node 12

77 0.25 0 → 1 139 0.17 0 → 1Node 12 🡪 Node 33

 5 0.40 0 → 1 14 1.00 0 → 1 98 0.50 0 → 1 213 0.33 0 → 1 242 0.20 1 → 0 255 0.33 0 → 1Node 33 🡪 Node 34

 23 0.50 1 → 2 25 0.20 1 → 0 51 0.50 0 → 1 86 0.67 0 → 2 210 0.20 1 → 0Node 34 🡪 Node 36

 55 0.25 0 → 1 144 0.17 0 → 1 157 0.33 0 → 1 204 0.50 0 → 1 209 0.20 0 → 1

 221 0.33 0 → 1 250 0.25 0 → 1 252 0.25 1 → 0Node 36 🡪 New Parksosaurus

 76 0.33 1 → 0 94 0.33 0 → 1 135 0.50 0 → 1 139 0.17 1 → 0 152 0.25 1 → 0 186 0.25 0 → 1 200 0.14 0 → 1 201 0.40 0 → 2 214 0.20 0 → 1 227 0.14 0 → 1Node 36 🡪 Node 37

 169 0.22 1 → 0 185 0.17 0 → 1 226 0.17 0 → 1Node 37 🡪 Node 39

 222 0.17 0 → 1Node 39 🡪*Thescelosaurus neglectus*

 110 0.33 0 → 1Node 39 🡪*Thescelosaurus assiniboiensis*

 99 0.25 0 → 1 156 0.40 0 → 2 186 0.25 0 → 1 195 0.40 0 → 1Node 37 🡪 Node 38

 145 0.50 1 → 0 168 0.25 0 → 2 197 0.43 2 → 1 205 0.25 0 → 1

Node 79 🡪*Macrogryphosaurus gondwanicus*

 141 0.50 0 → 1Node 34 🡪 Node 35

 74 0.38 2 → 1 75 0.14 0 → 1Node 35 🡪*Haya griva*

 5 0.40 1 → 0 12 0.25 1 → 0 68 0.33 1 → 0 85 0.20 1 → 0 92 0.50 0 → 1 167 0.17 1 → 0 255 0.33 1 → 0Node 35 🡪*Changchunsaurus parvus*

 38 0.50 0 → 2 44 0.25 0 → 1 59 0.20 1 → 0 114 0.20 1 → 0 121 0.20 0 → 1Node 33 🡪 Node 40

 108 0.40 0 → 1 114 0.20 1 → 0 143 0.33 1 → 2 148 0.43 2 → 3 158 1.00 0 → 1 233 1.00 0 → 1Node 40 🡪 Node 43

 144 0.17 0 → 1Node 43 🡪*Oryctodromeus cubicularis*

 146 0.25 0 → 1 149 0.50 0 → 1 163 0.50 0 → 1 222 0.17 0 → 1Node 43 🡪*Koreanosaurus boseongensis*

 159 0.50 0 → 1 162 0.25 0 → 1 227 0.14 0 → 1Node 40 🡪 Node 41

 38 0.50 0 → 3 55 0.25 0 → 1Node 41 🡪*Zephyrosaurus schaffi*

 5 0.40 1 → 0 27 0.50 0 → 1 91 0.25 1 → 0 99 0.25 0 → 1 109 0.25 1 → 2 201 0.40 0 → 1 205 0.25 0 → 1 236 0.33 0 → 2Node 41 🡪 Node 42

 122 0.67 1 → 0 210 0.20 1 → 0Node 42 🡪*Orodromeus makelai*

 62 0.33 0 → 1 222 0.17 0 → 1Node 42 🡪’Kaiparowits Orodromine’

 144 0.17 0 → 1 163 0.50 0 → 1 180 0.67 0 → 1 232 0.56 1 → 0 242 0.20 0 → 1Node 12 🡪 Node 13

 26 0.33 1 → 0 52 0.50 1 → 0 112 0.29 1 → 2 120 0.20 0 → 1 123 0.33 0 → 1 124 0.33 0 → 1 252 0.25 1 → 0Node 13 🡪 Node 29

 87 0.25 0 → 2 197 0.43 2 → 3 203 0.33 1 → 0Node 29 🡪 Node 30

 186 0.25 0 → 1 Node 30 🡪 Node 32

 85 0.20 1 → 0

Node 32 🡪 *Archaeoceratops oshimoi* 81 0.20 0 → 1 133 0.33 0 → 1Node 30 🡪 Node 31

 16 0.20 0 → 1

 50 0.25 1 → 0

Node 31 🡪*Liaoceratops yanzigouensis*

 38 0.50 1 → 2 75 0.14 0 → 1Node 31 🡪*Yinlong downsi*

 26 0.33 0 → 1 45 0.20 0 → 1 46 1.00 0 → 1 47 0.50 0 → 1 97 0.50 1 → 0 120 0.20 1 → 0 127 0.14 1 → 0

Node 32 🡪*Wannanosaurus yansiensis*

 23 0.50 1 → 2 24 1.00 0 → 1 63 0.25 0 → 1 114 0.20 1 → 0 130 0.25 1 → 0 139 0.17 1 → 0

Node 13 🡪 Node 14

 28 0.25 0 → 1 29 0.29 2 → 1 31 0.33 1 → 0 117 0.40 1 → 2 126 0.25 1 → 0

 132 0.44 2 → 0 250 0.25 0 → 1Node 14 🡪*Hypsilophodon foxii* 83 0.25 0 → 1 92 0.50 0 → 1 96 0.50 0 → 1 98 0.50 0 → 1 112 0.29 2 → 0 157 0.33 0 → 1 161 0.50 0 → 1 196 0.50 0 → 1

 204 0.50 0 → 1 232 0.56 1 → 2 234 0.60 0 → 1 245 0.40 0 → 1Node 14 🡪 Node 15

 49 1.00 0 → 1 75 0.14 0 → 1 108 0.40 0 → 2 119 0.50 0 → 1 130 0.25 1 → 0 149 0.50 0 → 1 200 0.14 0 → 1 207 0.17 0 → 1 228 0.38 3 → 2Node 15 🡪 Node 26

 124 0.33 1 → 0Node 26 🡪*Atlascoposaurus loadsi*

 138 0.33 0 → 1Node 26 🡪 Node 27

 117 0.40 2 → 1Node 27 🡪 Node 28

 75 0.14 1 → 0Node 28 🡪*Qantassaurus intrepidus*

 132 0.44 0 → 4Node 27 🡪*Anabisetia saldivai*

 139 0.17 1 → 0 168 0.43 1 → 2Node 15 🡪 Node 16

 34 0.13 1 → 0 47 0.50 0 → 1 61 1.00 0 → 1 65 0.17 0 → 1 81 0.20 0 → 1 132 0.44 0 → 1 136 1.00 0 → 1 182 0.33 0 → 1 208 0.50 0 → 1 221 0.25 0 → 1 224 0.50 0 → 1 226 0.17 0 → 1Node 16 🡪 Node 24

 28 0.25 1 → 0 29 0.29 1 → 2 64 0.50 0 → 1 74 0.38 2 → 0 105 0.20 1 → 0 148 0.43 2 → 3 149 0.50 1 → 2 184 0.25 0 → 1 186 0.25 0 → 1 213 0.33 0 → 1 227 0.14 0 → 1 238 0.20 1 → 0Node 24 🡪*Zalmoxes robustus*

 207 0.17 1 → 0

Node 16 🡪 Node 25

 37 0.50 1 → 0 101 0.17 0 → 1 127 0.14 1 → 0 142 0.25 0 → 1 205 0.20 1 → 0 232 0.56 1 → 3Node 25 🡪*Tenontosaurus dossi*

 17 0.50 0 → 1 111 0.50 1 → 0 195 0.40 0 → 1 227 0.14 0 → 1 245 0.40 0 → 1Node 25 🡪*Tenontosaurus tilletti*

 34 0.13 0 → 1 41 0.43 0 → 1 62 0.33 0 → 1 69 0.20 1 → 0 88 0.33 0 → 1 96 0.50 0 → 1 206 0.17 1 → 0 207 0.17 1 → 0Node 16 🡪*Rhabdodon priscus*

 84 0.50 0 → 1 168 0.25 1 → 0 193 0.33 0 → 2 203 0.25 1 → 0 221 0.25 1 → 0 235 0.33 0 → 1Node 16 🡪 Node 17

 36 0.50 0 → 1 51 0.50 0 → 1 142 0.25 0 → 1 235 0.33 0 → 1Node 17 🡪*Muttaburrasaurus longdoni*

 90 1.00 0 → 1 117 0.40 2 → 1Node 17 🡪 Node 18

 31 0.33 0 → 1 118 0.33 0 → 1 161 0.50 0 → 1Node 18 🡪 Node 19

 208 0.50 1 → 0 220 1.00 0 → 1 221 0.33 1 → 0Node 19 🡪 Node 21

 223 0.50 1 → 2Node 21 🡪*Elrhazosaurus nigeriensis*

 224 0.50 1 → 0 232 0.56 3 → 0Node 19 🡪 Node 20

 209 0.20 0 → 1 215 0.50 0 → 1 244 0.50 1 → 0Node 20 🡪*Dysalotosaurus lettowvorbecki*

 55 0.25 0 → 1 74 0.38 2 → 1 75 0.14 1 → 0 106 0.33 0 → 1 109 0.25 0 → 2 193 0.33 0 → 1Node 20 🡪*Dryosaurus altus*

 28 0.25 1 → 0 85 0.20 1 → 0 171 0.25 1 → 0 223 0.50 1 → 0

 241 0.33 0 → 1Node 19 🡪*Callovosaurus leedsi*

 217 0.40 2 → 1Node 18 🡪 Node 22 4 1.00 0 → 1 34 0.13 0 → 1 40 1.00 0 → 1 54 0.33 0 → 1 69 0.20 1 → 0 99 0.25 0 → 1 100 1.00 0 → 1 105 0.20 1 → 0 127 0.14 1 → 0 139 0.17 1 → 0 150 1.00 0 → 1 172 0.50 0 → 1 174 1.00 0 → 1 252 0.25 0 → 1Node 22 🡪*Camptosaurus dispar*

 56 0.33 0 → 1 107 0.33 0 → 1 142 0.33 1 → 0 185 0.17 1 → 0Node 22 🡪 Node 23

 29 0.29 1 → 2 36 0.50 1 → 0 39 1.00 0 → 2 45 0.20 0 → 1 64 0.50 0 → 1 77 0.25 1 → 0 101 0.17 0 → 1 109 0.25 0 → 2 169 0.22 1 → 2 170 0.50 0 → 1 171 0.25 1 → 0 231 0.50 0 → 1Node 23 🡪*Iguanodon bernissartensis*

 83 0.25 1 → 2Node 23 🡪*Ouranosaurus nigeriensis*

 30 0.25 1 → 0 53 0.17 1 → 0 72 0.25 1 → 0 108 0.40 2 → 0 211 0.25 1→ 0