

## The Pennsylvanian conodont genus *Gondolella* Stauffer & Plummer, 1932: reinterpretation of the original type specimens and concepts

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**ABSTRACT** – In order to ensure stability of nomenclature among species of *Gondolella*, lectotypes are selected from among the cotypes (syntypes in modern usage) proposed by Stauffer & Plummer (1932) for species that it is concluded were parts of the apparatuses of two species of that genus. It is recognized that many of their specimens actually represent growth stages of individual species, and many of the names used by Stauffer & Plummer are placed in synonymy. Interpreted synonyms include not only gondolelliform P<sub>1</sub> elements, but other parts of the apparatus, especially P<sub>2</sub> elements assigned to *Euprioniodina* by Stauffer & Plummer. Thus, *Gondolella bella* has synonyms as P<sub>1</sub> elements: *G. curvata*, *G. magna*, *G. minuta*, probably *G. sp. A*, S<sub>1</sub> element *Euprioniodina coronata* and P<sub>2</sub> elements: *E. exserta*, *E. eximia* and *E. intertexta*. In a similar manner, the type species of the genus, *Gondolella elegantula*, has synonyms *G. insolita*, *G. lanceolata* (P<sub>1</sub> elements), and probably *Euprioniodina sp. B* (P<sub>2</sub> element?). *J. Micropalaeontol.* 26(1): 41–46, April 2007.

**KEYWORDS:** *Gondolella*, Pennsylvanian, conodonts, Stauffer & Plummer, Texas

### INTRODUCTION, APPARATUSES AND ONTOGENY

Stauffer & Plummer based their 1932 concept of the genus *Gondolella* on gondola-shaped platform (pectiniform) elements from the Pennsylvanian of north-central Texas. Subsequent work (Rhodes, 1952; von Bitter, 1976; von Bitter & Merrill, 1998) showed that these gondola-shaped platform elements were parts of a skeletal apparatus that included several other kinds of elements. Thus, element types of differing morphologies occurring in single samples may be biologically parts of the apparatus of *Gondolella*, rather than just being ecological associates as postulated by Merrill (1973). This is also the case with several of Stauffer & Plummer's non-platform taxa; they are parts of and synonyms of species of *Gondolella*.

The designated type species of *Gondolella* is *G. elegantula* Stauffer & Plummer, by original designation. It remains so in spite of the attempt by Clark & Mosher (1966) to make that species a junior synonym of *G. bella* Stauffer & Plummer, described in the same 1932 work. Clark & Mosher (1966) used *G. bella* as the name for the synonymized species based, apparently, on page priority. This action has no status, because, even if one were to agree with their subjective synonymy – which the current paper does not – the original intent and the legally adequate designation by the original authors must prevail under Article 68.2 of the *International Code of Zoological Nomenclature* (ITZN, 1999).

That Clark & Mosher (1966) attempted to synonymize *Gondolella elegantula* and *G. bella* is not surprising because they look quite similar, in spite of being of significantly different geological ages. The reason for this apparent similarity is that the cotypes and paratype of *G. elegantula* and the holotype of *G. bella* are all juvenile (small) specimens. Stauffer & Plummer apparently used size as well as ornamentation as a specific criterion. Thus, a cotype of *G. insolita* (BEG 19156) has a reconstructed length of 0.9 mm, in contrast with a cotype of *G. elegantula* (BEG 19154) that is 0.2 mm shorter. Similarly, the incomplete cotype of *G. magna* (BEG 19158) has an extrapolated length of over 1.3 mm

whereas the complete holotype of *G. bella* (BEG 19152) from the same sample is only half as long (0.7 mm). This practice of describing and naming juvenile specimens makes it difficult to compare species of different geological ages because juveniles from different parts of the phylogeny bear a strong resemblance to one another. Fortunately, the authors have been able to recollect the *locus typicus* and *stratum typicum* for each of Stauffer & Plummer's gondolellid species, permitting their juvenile types to be placed in ontogenetic context. This study can, therefore, compare their types and recognize synonyms among them.

### MATERIALS AND METHODS, RE-EVALUATION OF STAUFFER & PLUMMER'S TYPES AND SELECTION OF LECTOTYPES

For the sake of taxonomic stability it is deemed necessary to select lectotypes from among Stauffer & Plummer's cotypes (Table 1).

### Geographical and stratigraphical constraints

Stauffer & Plummer's locality register credits others for collecting samples used in their study. Helen Jean Plummer's husband, F. B. Plummer, who was later State Geologist of Texas, apparently collected the bulk of these. Probably neither H. J. Plummer nor C. R. Stauffer visited any of the localities from which their collections were derived. Such disengagement of source and students opened the door for miscommunication of geographical and stratigraphical information unrelated to the specimens themselves. So it was with Stauffer & Plummer's sample information.

Although Stauffer & Plummer (1932) described conodonts from several other localities, only two of their localities yielded specimens of *Gondolella*. The geologically older of these was an upper Desmoinesian locality in Mineral Wells, Palo Pinto County, Texas, the well-known East Mountain locality. The

Stauffer & Plummer's taxon	Stauffer & Plummer's figure	BEG number <sup>a</sup>	Stratigraphic position	Stauffer & Plummer's locality	Comments
<i>Gondolella curvata</i>	pl. 3, figs 13, 14	19153	East Mountain Shale	Mineral Wells	Slightly more complete specimen
<i>Gondolella magna</i>	pl. 3, figs 7, 11	20944	East Mountain Shale	Mineral Wells	Preserves posterior terminus
<i>Gondolella elegantula</i>	pl. 3, fig. 8	19154	Posideon Shale	Wiles	Slightly more mature specimen
<i>Gondolella insolita</i>	pl. 3, fig. 15	19156	Posideon Shale	Wiles	
<i>Gondolella lanceolata</i>	pl. 3, fig. 16	20945	Posideon Shale	Wiles	
<i>Euprioniodina coronata</i>	pl. 2, fig. 8	20932	East Mountain Shale	Mineral Wells	Mature S element (=Sb <sub>2</sub> element in von Bitter & Merrill, 1998), other cotype is also an S element (=Sc element in von Bitter & Merrill 1998)

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**Table 1.** Current selections/designations of lectotypes between the cotypes (syntypes) of Stauffer & Plummer (1932).

other locality was more cryptically described, but was a lower Missourian locality near Wiles, Stephens County, Texas. The latter locality became the *locus typicus* for their type species, *Gondolella elegantula*.

Despite the fact that the East Mountain locality is well known and can be located precisely (14SNM839303 or 32°47'58"N 98°11'02"W), even here there was sample confusion. According to Stauffer & Plummer's locality register, they had samples from two intervals here, one a 'soft gray shale ... about ten feet above the base' of the section, and the other a 'dark' shale near the top of the section 'about ten feet below the Lake Pinto sandstone' (Stauffer & Plummer, 1932: 22–23). If this was correct, their samples were separated by more than 110 feet (33.5 m) of strata. Immediately apparent from an examination of the locality is that there is no black shale 'ten feet below the Lake Pinto sandstone'. The only black shale in the section occurs 10 m above the base of the section. Furthermore, continuous sampling from the base of the Lake Pinto Sandstone downward to the base of the section revealed only a single bed that could have yielded the faunas reported by Stauffer & Plummer as having come from two levels – the black shale 10 m above the base of the section. It is likely that what they listed as samples 181-T-9-A and 181-T-9-B were, in fact, both derived from this shale 10 m above the base of the section and not one, but both, of their listed sample intervals were incorrect. This singularity of sampling has had an impact on gondolellid taxonomy and subsequent attempts to build a phylogenetic tree and biostratigraphical framework based on a distinction between somewhat less advanced forms from their 'lower' sample and somewhat more advanced ones from their 'upper' one (referred to as *Gondolella bella* and *G. magna*, respectively by Merrill, 1975). Realization that they were members of a continuous population necessitates taxonomic and phylogenetic revisions.

Stauffer & Plummer's other locality near Wiles has been relocated and, together with the East Mountain locality, was discussed and described by Merrill *et al.* (1987) and Merrill & Grayson (1989). Briefly, it can be located precisely at 14SLN38919989 or 32°32'14"N 98°35'08"W in a light-coloured, shelly shale directly above the Wiles Limestone.

All elements from Stauffer & Plummer (1932) are purposely re-illustrated in the same orientation as they were in their paper; the upper surfaces of P<sub>1</sub> elements, photographed using electron microscopy, have thus been re-illustrated with the posterior part of the element toward the top of the page, and the anterior part

toward the bottom. This practice achieves consistency between Stauffer & Plummer's (1932) publication and the current paper – one of the aims; it is also consistent with the orientation shown for *Gondolella* and other P<sub>1</sub> elements in Hass (1962) and Lindström (1964, fig. 55c) as well as specifically for *Gondolella* P<sub>1</sub> elements illustrated by Klapper *et al.* (1981, figs 100.1b, 100.1c) and von Bitter & Merrill (1998, fig. 3). M. A. Purnell (pers. comm., 2005) has pointed out that this orientation coincidentally 'accords with *in vivo* orientation of P elements' within conodonts.

## SYSTEMATIC DESCRIPTIONS

### General note

The following descriptions and synonymies are based exclusively on materials from the Stauffer & Plummer (1932) study and taxa subsequently described by others are not treated. Some parts of the synonymies were suggested by Merrill *et al.* (1987). Based upon ontogenetic analyses and apparatus reconstructions, several of Stauffer & Plummer's taxa are placed in synonymy. Indeed, it is the authors' interpretation that only a single species of *Gondolella* was present at each of their two collecting sites and the other described species are either ontogenetic stages or anatomical associates. The species given alphabetical and page priority at each locality (*G. bella* and *G. elegantula*) are thus chosen as name bearers, the latter unavoidably so because it is the type species by original designation. Element kinds are designated according to the system proposed by Purnell *et al.* (2000), but are orientated according to more conventional usage to facilitate comparison with the literature, including Stauffer & Plummer's original work.

Stauffer & Plummer's gondolellid material is re-illustrated in three different ways. Initially their drawings are reproduced (Plate 1) at their original magnifications (×40), arranged, where possible, in order of size and ontogenetic growth (e.g. illustrations 3A, 4A, 5A, etc.). Secondly, SEM micrographs of gondolellid P<sub>1</sub>, P<sub>2</sub> and S elements are provided (Plate 1) at constant magnifications (×60) in plan view, so that relative, true sizes may be compared. Finally, oblique views of P<sub>1</sub> elements are provided at ×50, so that morphological details may be seen more readily.

The specimen numbers have been listed in the manner in which the slides are labelled, with numbers carrying the prefix BEG for the Bureau of Economic Geology. Because the

specimens are currently housed in the Texas Memorial Museum, a fuller prefix should read TMM/BEG, but the original has been retained for brevity.

Superfamily **Gondoleloidea** Lindström, 1970  
Family **Gondolellidae** Lindström, 1970  
Genus *Gondolella* Stauffer & Plummer, 1932

*Gondolella bella* Stauffer & Plummer, 1932  
(Pl. 1, figs 1A–12B)

- v\*1932 *Gondolella bella* Stauffer & Plummer: 42, pl. 3, figs 3, 4 (P<sub>1</sub> element).  
v●1932 *Gondolella curvata* Stauffer & Plummer: 42, pl. 3, figs 13, 14, 17 (P<sub>1</sub> element).  
v●1932 *Gondolella magna* Stauffer & Plummer: 43, 44, pl. 3, figs 6, 7, 10, 11 (P<sub>1</sub> element).  
v●1932 *Gondolella minuta* Stauffer & Plummer: 44, pl. 3, figs 1, 2 (P<sub>1</sub> element).  
?1932 *Gondolella* sp. A Stauffer & Plummer: 44, pl. 3, figs 18, 19 (P<sub>1</sub> element).  
v●1932 *Euprioniodina coronata* Stauffer & Plummer: 30, 31, pl. 2, figs 7–9 (S<sub>1</sub> element).  
v●1932 *Euprioniodina exserta* Stauffer & Plummer: 31, pl. 2, fig. 22 (P<sub>2</sub> element).  
v●1932 *Euprioniodina eximia* Stauffer & Plummer: 31, pl. 2, fig. 36 (P<sub>2</sub> element).  
v●1932 *Euprioniodina intertexta* Stauffer & Plummer: 32, pl. 2, fig. 35 (P<sub>2</sub> element).

**Type species.** *Gondolella elegantula* Stauffer & Plummer, 1932, by original designation.

**Diagnosis.** A species of *Gondolella* in which the adult P<sub>1</sub> elements are ornamented primarily by transverse ridges, some of which may cross the carinal row and many of which bifurcate laterally, producing ‘facets’ along the margins of the platform.

**Locality.** All illustrated and synonymized specimens are from a single locality (and by the authors’ interpretation a single stratigraphic interval), the Mineral Wells Formation (now East Mountain Shale) in Mineral Wells, Palo Pinto Co., Texas, USA.

**Description.** (P<sub>1</sub> elements) Juvenile specimens (Pl. 1, figs 2, 3) are elongate with sharply pointed anterior and posterior termini, the former lacking any significant free blade and the latter consisting of the terminal denticle of the carinal row that is swept upward and posteriorly as the posterior terminus of the platform. Denticles of the carinal row are compressed laterally, sharply pointed, and more or less discrete. Oral surface of the platform is mostly plain with the lateral edges slightly upturned. A few small, discrete nodes may be present on the oral surface of the platform along the lateral margins, more commonly posteriorly (Pl. 1, figs 2, 3). During ontogeny the platform lengthens anteriorly and widens, the lateral nodes increase in number and become a continuous row of nodes that coalesce antero-posteriorly forming lateral ridges with slight scallops between nodes. The lateral nodes also extend medially as low ridges. With increasing maturity the lateral margins may become

entirely scalloped or faceted by antero-posteriorly fused nodes. Cross-ridges developed from medial extension of the lateral nodes may form ridges that cross the carinal nodes and thus may extend from one platform margin to the other. Carinal nodes may become partially fused antero-posteriorly and connected with one another by a ridge or ‘web’ (Pl. 1, fig. 6). Overall platform shape in adult specimens is blunt or squared posteriorly and tapering gradually to a sharp anterior terminus without a significant free blade.

**Remarks.** The several ‘species’ of gondolellid P<sub>1</sub> elements described by Stauffer & Plummer, when arranged by size, make a convincing ontogenetic, or growth, series. Stauffer & Plummer described several additional ‘species’, species that are interpreted to have been other elements within the apparatus of this species. These are figured (Pl. 1, figs 8–12), but not described, and it is concluded that they do not differ significantly from the homologous elements in the apparatuses of other species of *Gondolella*, such as *G. pohli* as described fully by von Bitter & Merrill (1998). *Gondolella* sp. A of Stauffer & Plummer (1932 pl. 3, figs 18, 19) is probably also a synonym; however, the specimen is missing and the assignment cannot be confirmed.

*Gondolella elegantula* Stauffer & Plummer, 1932  
(Pl. 1, figs 13A–19C)

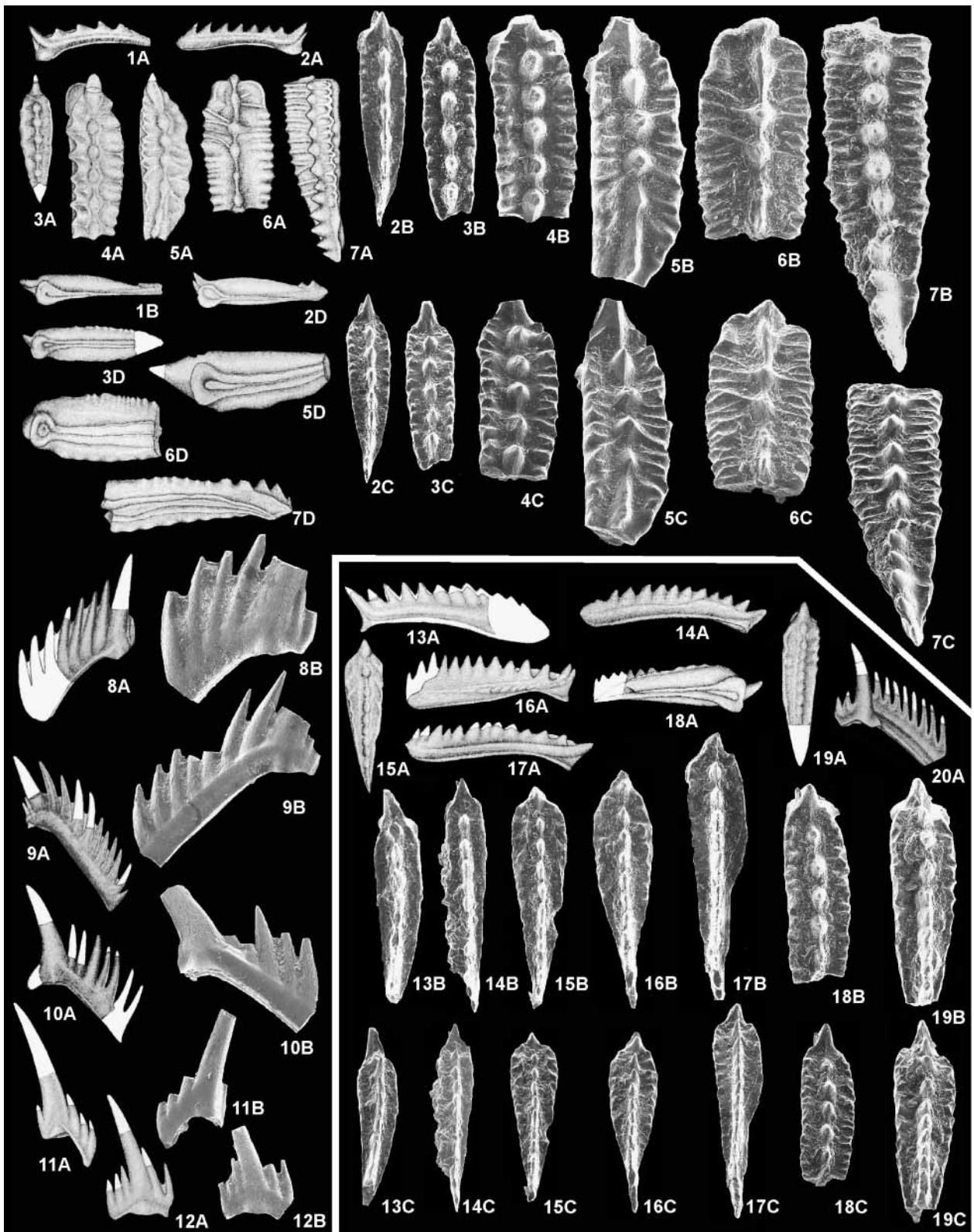
- v\*1932 *Gondolella elegantula* Stauffer & Plummer: 42, 43, pl. 3, figs 5, 8, 9 (P<sub>1</sub> element).  
v●1932 *Gondolella insolita* Stauffer & Plummer: 43, pl. 3, figs 15, 22 (P<sub>1</sub> element).  
v●1932 *Gondolella lanceolata* Stauffer & Plummer: 43, pl. 3, figs 12, 16 (P<sub>1</sub> element).  
?1932 *Euprioniodina* sp. B Stauffer & Plummer: 32, pl. 2, fig. 34 (P<sub>2</sub> element?).

**Diagnosis.** A species of *Gondolella* in which the adult P<sub>1</sub> elements are ornamented primarily by marginal ridges with lateral ‘facets’ that are the remnants of ancestral transverse ridges; some evidence of these ridges is present on ontogenetically less mature specimens.

**Locality.** All illustrated and synonymized specimens are from a single locality, the Graford Formation (now Posideon Shale), near Wiles townsite, Stephens Co., Texas, USA.

**Description.** (P<sub>1</sub> elements) Juvenile elements are elongate with sharply pointed anterior and posterior termini, the former with some small amount of free blade, the latter consisting of the terminal denticle swept upward and posteriorly and more or less a continuation of the entire posterior part of the platform. Denticles of the carinal row are compressed laterally, sharply pointed and more or less discrete. Oral surface of platform is mostly plain with lateral edges that are slightly upturned. A few small, discrete nodes may be present along one or both margins of the platform. These are more prominent posteriorly. During ontogeny the platform lengthens anteriorly, possibly retaining a short free blade. The platform also widens and develops ornamentation that consists of a row of nodes along each lateral margin of the platform. Each node shows a strong connection





with adjacent nodes, producing numerous scallops, but little tendency to develop into lateral ridges.

**Remarks.** The most mature specimen of this species illustrated by Stauffer & Plummer is their cotype of *Gondolella insolita*, which has been selected here as lectotype. That specimen is only submature, so that no fully adult specimen of the species is available from their collection; hence re-description of the type species of the genus must await description of available topotype material. Nevertheless, some differences are evident in the lack of prominent transverse ridges in *Gondolella elegantula* as opposed to those in *G. bella*. Stauffer & Plummer's (1932) figured specimen of *Euprioniodina* sp. B appears to be the P<sub>2</sub> element of a gondolellid apparatus and hence a probable junior synonym of *G. elegantula*, but the specimen is missing and identification cannot be confirmed.

## CONCLUSIONS

Stauffer & Plummer (1932) described a series of relatively different-looking platform elements as species of their new genus *Gondolella*. In conjunction with topotype material recovered by the authors, a re-study of their type specimens demonstrates that their collections came from only two horizons from different localities and that their several species at each of these are actually parts of a pair of continuous ontogenetic series. In other words, each of their localities actually yielded a single species of the genus and the necessary steps have been taken to place their several species in synonymy. Because such synonymy is subjective – and subject to future revision and modification by later workers – an important step toward taxonomic stability has also been taken by selecting lectotypes among Stauffer & Plummer's cotypes. Finally, it should be noted that Stauffer & Plummer (1932) also described several 'species' under the generic name *Euprioniodina*, 'species' that are actually elements other than the P<sub>1</sub> elements of the apparatuses of species of *Gondolella*. By also listing these as junior synonyms of co-occurring gondolellid species, an attempt has been made to avoid the possibility that they might be considered senior synonyms at some future date. It is noted that Stauffer & Plummer described gondolellid P<sub>2</sub> (and other) elements under *Euprioniodina*, but described somewhat similar P<sub>2</sub> elements of the *Idiognathodus*–*Streptognathodus* plexus under the generic name *Bryantodus*, as well as some other probable elements of that apparatus under such names as

*Hindeodella*. These specific names are also available and in competition and some could be resurrected as senior synonyms in the future.

## ACKNOWLEDGEMENTS

The authors would first like to thank Dr Ann Molineux of the Texas Memorial Museum, The University of Texas at Austin for arranging the loan of these specimens for study and for permission to coat them for SEM illustration. Generally, arranging such a loan is not a complicated procedure, but in this case it was, and she made a great effort on the authors' behalf for which they are most grateful. In addition, Ms Kathy David, Royal Ontario Museum, Palaeobiology Section, Department of Natural History, carried out the scanning electron microscopy and digitally assembled Plate 1.

Manuscript received 20 April 2005

Manuscript accepted 6 July 2006

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## Explanation of Plate 1.

**figs 1–12.** *Gondolella bella* from East Mountain Shale, Mineral Wells, Palo Pinto Co., Texas, USA. The illustrations to the left are the line drawings of Stauffer & Plummer at their original publication scale of  $\times 40$ , those to the right designated with a 'B' suffix are vertical (oral) views at a constant  $\times 60$ , those designated with a 'C' suffix are oblique views at a constant  $\times 50$ : **1**, lateral and aboral views of *G. sp. A*, specimen lost; **2**, lateral, oral, oblique and aboral views of the holotype of *G. bella*, BEG 19152; **3**, oral, oral, oblique and aboral views of the holotype of *G. minuta*, BEG 19159; **4**, oral, oral and oblique views of a cotype of *G. curvata*, BEG 20948; **5**, oral, oral, oblique and aboral views of a cotype (now lectotype) of *G. curvata*, BEG 19153; **6**, oral, oral, oblique and aboral views of a cotype (now lectotype) of *G. magna*, BEG 20944; **7**, oral, oral, oblique and aboral views of a cotype of *G. magna*, BEG 19158; specimens illustrated in figs 8–12 are lateral views of non-P<sub>1</sub> elements of *G. bella* – **8**, holotype of *Euprioniodina intertexta*, BEG 19121 (P<sub>2</sub> element); **9**, holotype of *E. eximia*, BEG 19118 (P<sub>2</sub> element); **10**, holotype of *E. exerta*, BEG 19119 (P<sub>2</sub> element); **11**, cotype (now lectotype) of *E. coronata*, BEG 20932 (S element=Sb<sub>2</sub> element in von Bitter & Merrill, 1998); **12**, cotype of *E. coronata*, BEG 19117 (S element=Sc element in von Bitter & Merrill, 1998). **figs 13–19.** *Gondolella elegantula* from Posideon Shale, Wiles town site, Stephens Co., Texas, USA. Those above and with an 'A' suffix are the line drawings of Stauffer & Plummer at their original scale of  $\times 40$ , those with a 'B' suffix are vertical oral views at a constant  $\times 60$ , those with a 'C' suffix are oblique views at a constant  $\times 50$ : **13**, lateral, oral and oblique views, paratype of *G. elegantula*, BEG 19155; **14**, lateral, oral and oblique views, cotype (now lectotype) of *G. elegantula*, BEG 19154; **15**, oral, oral and oblique views, cotype (now lectotype) of *G. lanceolata*, BEG 20945; **16**, lateral, oral and oblique views, cotype of *G. lanceolata*, BEG 19157; **17**, lateral, oral and oblique views, cotype of *G. elegantula*, BEG 20946; **18**, aboral, oral and oblique views, cotype of *G. insolita*, BEG 20947; **19**, oral, oral and oblique views, cotype (now lectotype) of *G. insolita*, BEG 19156; **20**, lateral view of *Euprioniodina* sp. B (probable P<sub>2</sub> element, specimen lost).

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