

# 中國古生物誌

總號第140冊

新乙種第6號

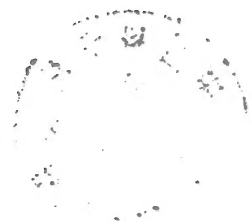
中國科學院 古生物研究所 編輯  
古脊椎動物研究室

## 中國南部的筳科 II 中國二疊紀茅口灰岩的筳科動物羣

陳 旭



科學出版社



58.31/30  
287  
58.232  
787

# 中國古生物誌

總號第140冊

新乙種第6號

編輯委員會

李四光 楊鍾健 斯行健 孫雲鑄  
尹贊勳 俞建章 陳 旭

## 中國南部的筳科 II

### 中國二疊紀茅口灰岩的筳科動物羣

陳 旭

(南京大學地質學系)

圖版 14

中國科學院古生物研究所編輯  
古脊椎動物研究室

科學出版社出版



中科院植物所圖書館



S0022166

## 內 容 提 要

此書是介紹我國中南西南各省灰岩中所產的微小的動物化石叫筵科動物羣的化石。由於這些化石的發現，當可鑑定西南及中南省的地層年代，對勘探地質礦產工作很有幫助的。

### 中國古生物誌

總號第140冊 新乙種第6號

### 中國南部的筵科 II 中國二疊紀茅口灰岩的 筵科動物羣

---

著 者	陳 旭
編 輯 者	中國科學院古生物研究所 古脊椎動物研究室
出 版 者	科 學 出 版 社 北京東皇城根甲42號 北京市書刊出版業營業許可證出字第061號
印 刷 者	上海中科藝文聯合印刷廠
總 經 售	新 華 書 店

---

1956年6月第一版	書號：0444 字數：144,000
1956年6月第一次印刷	開本：787×1092 1/10
(滬) 0001—2,225	印張：8 插圖：14

定價：(11) 2.70 元



# 目 錄

一. 緒言.....	1
二. 化石記述.....	1
根足綱 Rhizopoda .....	1
有孔蟲目 Foraminifera d'Orbigny .....	1
筳科 Fusulinidae Möller .....	1
汪氏筳亞科 Ozawainellinae Thompson & Foster .....	1
汪氏筳屬 <i>Ozawainella</i> Thompson .....	1
<i>Ozawainella hunanensis</i> Chen (新種) .....	1
南京筳屬 <i>Nankinella</i> Lee .....	2
<i>Nankinella inflata</i> (Colani) .....	2
舒氏筳亞科 Schubertellinae Skinner .....	2
楊氏筳屬 <i>Yangchienia</i> Lee .....	2
<i>Yangchienia kwangsiensis</i> Chen (新種) .....	2
包氏筳亞科 Boultoninae Skinner & Wilde .....	2
格氏筳屬 <i>Gallowainella</i> Chen .....	2
<i>Gallowainella minima</i> Chen (新種) .....	2
希氏筳亞科 Schwagerininae Dunbar & Henbest .....	3
希氏筳屬 <i>Schwagerina</i> Möller .....	3
<i>Schwagerina subobsoletus</i> var. <i>okuboensis</i> Ozawa .....	3
<i>Schwagerina tieni</i> Chen (新種) .....	3
<i>Schwagerina kwangchiensis</i> Chen (新種) .....	3
<i>Schwagerina henbesti</i> Chen (新種) .....	3
<i>Schwagerina wuhsüehensis</i> Chen (新種) .....	4
<i>Schwagerina paralpina</i> Chen (新種) .....	4
<i>Schwagerina megalocula</i> Chen (新種) .....	4
<i>Schwagerina longipertica</i> Chen (新種) .....	4
<i>Schwagerina yüi</i> Chen (新種) .....	4
<i>Schwagerina skinneri</i> Chen (新種) .....	4
<i>Schwagerina tienchiaensis</i> Chen (新種) .....	5
<i>Schwagerina exilis</i> Schwager .....	5
<i>Schwagerina lingyunensis</i> Chen (新種) .....	5
<i>Schwagerina mengi</i> Chen (新種) .....	5
<i>Schwagerina brevipola</i> Chen (新種) .....	5
<i>Schwagerina multialveola</i> Chen (新種) .....	6
<i>Schwagerina suni</i> Chen (新種) .....	6
<i>Schwagerina chinensis</i> Chen (新種) .....	6
<i>Schwagerina hunania</i> Chen (新種) .....	6
<i>Schwagerina yunnanensis</i> Chen (新種) .....	6
<i>Schwagerina longitermina</i> Chen (新種) .....	6
<i>Schwagerina hupehensis</i> Chen (新種) .....	7

<i>Schwagerina pactiruga</i> Chen (新種) .....	7
<i>Schwagerina granum-avenae</i> Roemer .....	7
朱森筵屬 <i>Chusenella</i> Hsu .....	7
<i>Chusenella tingi</i> Chen (新種) .....	8
<i>Chusenella deprati</i> Ozawa .....	8
<i>Chusenella conicocylindrica</i> Chen (新種) .....	8
<i>Chusenella douvillei</i> (Colani) .....	8
似希氏筵屬 <i>Paraschwagerina</i> Dunbar & Skinner .....	9
<i>Paraschwagerina shengi</i> Chen (新種) .....	9
韋氏筵亞科 Verbeekinae Staff & Wedekind .....	9
韋氏筵屬 <i>Verbeekina</i> Staff .....	9
<i>Verbeekina verbeeki</i> Geinitz .....	9
<i>Verbeekina verbeeki sphaera</i> Ozawa .....	9
<i>Verbeekina ellipsoidalis</i> Chen (新種) .....	9
<i>Verbeekina crassispira</i> Chen (新種) .....	9
米氏筵屬 <i>Misellina</i> Schenck & Thompson .....	10
<i>Misellina lepida</i> (Schwager) .....	10
<i>Misellina major</i> Deprat .....	10
<i>Misellina compacta</i> Chen (新種) .....	10
假米氏筵屬 <i>Pseudodoliolina</i> Yabe & Hanzawa .....	10
<i>Pseudodoliolina ozawai</i> Yabe & Hanzawa .....	10
新希氏筵亞科 Neoschwagerininae Dunbar & Condra .....	11
格子筵屬 <i>Cancellina</i> Hayden .....	11
<i>Cancellina schellwieni</i> Deprat .....	11
新希氏筵屬 <i>Neoschwagerina</i> Yabe .....	11
<i>Neoschwagerina simplex</i> Ozawa .....	11
<i>Neoschwagerina craticulifera</i> Schwager .....	11
<i>Neoschwagerina douvillei</i> Ozawa .....	12
<i>Neoschwagerina colaniae</i> Ozawa .....	12
<i>Neoschwagerina multicircumvoluta</i> Deprat .....	12
<i>Neoschwagerina leei</i> Chen (新種) .....	12
<i>Neoschwagerina margaritae</i> Deprat .....	12
<i>Neoschwagerina megaspherica</i> Deprat .....	13
矢部筵屬 <i>Yabeina</i> Deprat .....	13
<i>Yabeina shiraiwensis</i> Ozawa .....	13
<i>Yabeina inouyei</i> Deprat .....	13
<i>Yabeina proboscis</i> Chen (新種) .....	14
<i>Yabeina</i> sp. ....	14
阿富汗筵屬 <i>Afghanella</i> Thompson .....	14
<i>Afghanella schencki</i> Thompson .....	14
<i>Afghanella sumatrinaeformis</i> Gubler .....	14
蘇門答臘筵屬 <i>Sumatrina</i> Volz .....	15
<i>Sumatrina annae</i> Volz .....	15
<i>Sumatrina longissima</i> Deprat .....	15
參考文獻 .....	15
外文附錄 .....	17
圖版及其說明 .....	72

# 中國南部的筵科 II

## 中國二疊紀茅口灰岩的筵科動物羣

### 一. 緒 言

中國南部筵科的第二部分，是專述我國西南及中南各省茅口灰岩以及湖南省清溪沖灰岩與湖北省武穴灰岩所產筵科化石。此一筵科生物羣包括許多高等筵科化石如 *Schwagerina*, *Chusenella*, *Verbeekina*, *Misellina*, *Pseudodoliolina*, *Neoschwagerina*, *Yabeina*, *Afghanella*, *Sumatrina* 等。

茅口灰岩及其相當的灰岩在我國南部分佈甚廣且很發育。雲南、貴州、四川、廣西、湖南、湖北，以及安徽南部均有分佈。西南各省的茅口灰岩厚達百餘米，底部為含燧石結核的深灰色灰岩，中、上部為淺灰色純潔灰岩。所含化石除上述筵科外，並產珊瑚及腕足類動物化石。安徽南部的茅口灰岩為深灰色含燧石結核的灰岩，厚 20—30 米，產有 *Verbeekina verbeeki* Geinitz, *Misellina lepida* Schwager 等化石，屬茅口灰岩下部。

茅口灰岩及其相當的灰岩中的筵科化石甚為豐富，種類繁多，形體較大，構造複雜，易於識別。惜分層工作尚未進行，所以其中重要筵科種屬在地層中分佈情形不甚明瞭。其中最普通而常見的種類的大概分佈情形如下。

*Verbeekina verbeeki* Geinitz 多產於茅口灰岩的中部，有時單獨發育於某些岩層中，而不與其他筵類共生。*Misellina lepida* Schwager 通常發現於中、上部。*Pseudodoliolina ozawai* Yabe et Hanzawa 產於下部。*Neoschwagerina craticulifera* Schwager 多產於該灰岩的中、下二部。*Neoschwagerina margaritae* Deprat 似僅產於上部。*Sumatrina annae* Volz 和 *Sumatrina longissima* Deprat 多產於茅口灰岩的中部。

本篇所述的化石大部分採自湖北廣濟、湖南湘鄉及廣西各地。丁文江採自雲南的一部分筵類化石亦在此文中予以敘述。共計 15 屬，53 種，內有新種 32 種。

我甚感激李四光老師的指導與鼓勵。並感謝田奇瑞、孟憲民、李捷、張文佑諸先生供給許多化石材料。

本文圖版蒙何炎同志代為整理，其中相當數量化石圖為中國科學院古生物研究所劉雪筠先生攝影，均於此致以謝忱。

### 二. 化石記述

根足綱 Rhizopoda 有孔蟲目 Foraminifera d'Orbigny

筵科 Fusulinidae

汪氏筵亞科 Ozawainellinae Thompson & Foster, 1937

汪氏筵屬 *Ozawainella* Thompson, 1935

屬型 *Ozawainella angulata* (Colani) = *Fusulinella angulata* Colani, 1924

殼小，凸鏡狀，軸短於直徑，邊緣尖銳；胎室小，為球形；殼圈兩側對稱；旋脊粗大，內側陡而外側斜；旋壁薄，為外疏鬆層，緻密層，透明層與內疏鬆層所組成；隔壁平直不褶縐。

*Ozawainella hunanensis* Chen (新種)

(圖版 1, 圖 1—3)

殼小，臍部凸起，邊緣稍尖銳；殼軸長 1.46—1.65 毫米；直徑 2.75—2.87 毫米；殼圈數 9，殼圈中部凸起

甚高，邊緣夾角約  $45^\circ$ 。

旋壁為緻密層，透明層及內疏鬆層所構成，外疏鬆層不發達。隔壁薄而平直，隔壁口為腎形；旋脊小，位於殼圈邊緣兩側；胎室小，為球形，直徑僅 0.13 毫米。

**層位與產地：**湖南省湘鄉縣壺天，清溪沖灰岩下部，與 *Neoschwagerina craticulifera* 及 *Sumatrana annae* 共生。廣西省遷江，茅口灰岩亦產之。

### 南京筴屬 *Nankinella* Lee, 1933

#### 屬型 *Nankinella orbicularia* Lee, 1931

殼中等大小，為凸鏡狀，邊緣鈍圓，臍部凸起，殼圈多；旋壁為緻密層，透明層及內疏鬆層所構成；隔壁幾平直；胎室小；旋脊粗；隔壁口為腎形。

#### *Nankinella inflata* (Colani)

(圖版 I, 圖 4—7)

殼為扁圓形，軸較直徑為短，邊緣圓；旋壁薄，其組織因保存不佳不清晰，但似有緻密層，透明層及內疏鬆層；隔壁厚而短，幾平直；隔壁口甚窄，為新月形；旋脊位於殼圈邊緣兩側斜坡上；胎室為圓球形，頗大。

**層位與產地：**廣西省崇善，茅口灰岩。

### 舒氏筴亞科 *Schubertellinae* Skinner, 1931

#### 楊氏筴屬 *Yangchienia* Lee, 1933

#### 屬型 *Yangchienia iniqua* Lee, 1933

殼小，紡錘形；內部殼圈作凸鏡狀，其旋轉軸幾與外部殼圈軸成直交；旋壁甚薄，為緻密層與透明層所成，無疏鬆層；隔壁平直；旋脊粗而寬，其外側向殼的兩端傾斜。

#### *Yangchienia kwangsiensis* Chen (新種)

(圖版 I, 圖 8—11)

殼小，紡錘形，中部凸起頗高，兩端尖銳，長 1.43 毫米，寬 0.89 毫米，有七殼圈，均緊密，首二圈為球形，其餘殼圈為紡錘形。

旋壁特薄，有緻密與透明二層；隔壁不褶縐；旋脊寬而高，向殼端延展至其附近；無軸部填充物；胎室未見到。

**層位與產地：**廣西省凌雲，茅口灰岩出產頗多，與 *Schwagerina exilis* Schwager 及 *Afghanella schenckii* Thompson 共生。

### 包氏筴亞科 *Boultoninae* Skinner & Wilde, 1954

#### 格氏筴屬 *Gallowaiinella* Chen, 1937

#### 屬型 *Gallowaiinella meitienensis* Chen = *Gallowayina meitienensis* Chen, 1934

殼為次圓柱形；旋壁有緻密與透明二層；隔壁全面褶縐，規則而強烈；無旋脊；軸部填充物僅停積於內部殼圈內；胎室小，為圓球形。

#### 格氏筴 *Gallowaiinella minima* (新種)

(圖版 I, 圖 22—24)

殼甚小，為不規則次圓柱形，長 2.60 毫米，寬 0.54 毫米，中部扁平，兩端延伸頗長，有五殼圈，均甚緊密，

第一圈爲凸鏡狀，第二圈爲圓球狀，其餘殼圈很快地向兩端伸長而成次圓柱狀；旋壁很薄，外爲緻密層，內爲透明層；隔壁在首二殼圈內者不褶縐，在外部殼圈內者褶縐規則，幾及隔壁全面；無旋脊；軸部填充物僅於第三殼圈兩側部分內稍有停積；胎室未見及。

**層位與產地：**湖南省湘鄉縣，清溪沖灰岩。

### 希氏筵亞科 *Schwagerininae* Dunbar & Henbest, 1930

#### 希氏筵屬 *Schwagerina* Möller, 1877

#### 屬型 *Schwagerina princeps* (Ehrenberg) = *Borelis princeps* Ehrenberg, 1842

殼爲紡錘形或次圓柱形；旋壁爲緻密層與蜂窩層組成；隔壁褶縐強烈，隣近二隔壁褶縐的下部互相接觸，將一長的殼室分爲許多小室；隔壁口爲長形；旋脊全缺或不完全，僅生於內部殼圈。

#### *Schwagerina suboboletus* var. *okuboensis* Ozawa

(圖版 I, 圖 12)

殼小，次圓柱形，中部微凸，兩端圓，長 3.61 毫米，寬 1.33 毫米，有六、七緊密殼圈；旋壁薄，蜂窩組織粗；隔壁中部平直，兩端部分稍起褶縐；旋脊自胎室外壁開始直達最後殼圈；軸部填充物僅發生於內部殼圈內，爲不規則圓形；胎室小，爲球形。

**層位與產地：**湖南省湘鄉縣洪山殿，清溪沖灰岩，與 *Neoschwagerina leei* Chen 伴生。

#### *Schwagerina tieni* (新種)

(圖版 I, 圖 13—16)

殼小，爲長紡錘形，中部稍凸，兩端微圓，長 2.79 毫米，寬 0.69 毫米，有七殼圈；間有長達 4.49 毫米，寬 1.08 毫米；旋壁薄，蜂窩組織頗細；隔壁僅下半部起圓形褶縐，即於兩端部分亦僅成簡單網狀結構；隔壁高而窄；旋脊發育至六殼圈；胎室微小，爲球形，外壁厚，直徑不過 0.09 毫米；軸部填充物爲長棒形，自胎室兩旁向兩側延伸幾至殼的兩端。

**層位與產地：**湖南省湘鄉縣壺天，清溪沖灰岩下部。

#### *Schwagerina kwangchiensis* (新種)

(圖版 I, 圖 17, 18)

殼爲長次圓柱形，微彎，中部稍凸，兩端圓，有六、七殼圈，長 6.15 毫米，寬 1.54 毫米；殼圈緊密，首三、四圈更緊；旋壁薄，蜂窩組織細；隔壁頗厚，幾全面起頗規則而強烈褶縐；隔壁口低而窄；旋脊僅發生於內部數殼圈內，甚微弱；軸部填充物狹而長；胎室爲球形，直徑 0.28 毫米。

**層位與產地：**與 *Chusenella deprati* Ozawa 同產於湖北省廣濟縣田家鎮，武穴灰岩。

#### *Schwagerina henbesti* (新種)

(圖版 I, 圖 19—21)

殼次圓柱形，有時微彎，有八殼圈，長 8.28 毫米，寬 2.42 毫米。殼圈發育分二期：第一期有四殼圈，爲紡錘形，特別緊密；第二期亦有四圈，均爲次圓柱形，頗寬鬆。內部四殼圈的旋壁甚薄，以後隨生長而逐漸增厚；隔壁在第一發育期內幾平直；在第二期時褶縐強烈而不甚規則；隔壁口一般低而窄；旋脊微小，僅發生於內部緊密殼圈內；胎室微小，爲球形，直徑長 0.08 毫米；軸部填充物窄而不規則，僅存在於第二期殼圈的軸部。

**層位與產地：**湖北省廣濟縣田家鎮，武穴灰岩，與 *Chusenella douvillei* (Colani) 及 *Neoschwagerina craticulifera* Schwager 共生。



***Schwagerina wuhsüehensis* (新種)**

(圖版 II, 圖 4—6)

殼小,標準者為規則紡錘形,有時近兩端處縮小而使兩端突出,長 6.50 毫米,寬 1.43 毫米,有七個半殼圈,均緊密而內部四圈尤緊;旋壁薄,蜂窩組織細;隔壁在內部四緊密殼圈內者幾無褶縐;其餘殼圈內的隔壁褶縐寬而圓;旋脊微小,僅見於內部殼圈;隔壁口低而窄;軸部填充物狹而長;胎室微小,為球形,直徑 0.08 毫米。

**層位與產地:** 湖北省廣濟縣田家鎮,武穴灰岩出產頗多,與 *Chusenella douvillei* (Colani) 及 *Neoschwagerina craticulifera* Schwager 同生。

***Schwagerina paralpina* (新種)**

(圖版 II, 圖 9—11)

殼為次圓柱形,稍柔弱,兩端鈍圓,長 7.22 毫米,寬 2.42 毫米,有六個半殼圈;首三圈緊密,為紡錘形,其他殼圈寬鬆,為次圓柱形;旋壁薄,沿殼軸方向有輕微波動,蜂窩組織細。隔壁薄,在內部殼圈內者其下部有寬褶縐;在外部殼圈內者褶縐強烈,幾及其頂部;隔壁近兩端部分的褶縐互相接觸而成細網結構。旋脊不發育,似僅生於胎室的表面或伸入第一殼圈。無軸部填充物。胎室小,為球形,直徑約 0.20 毫米。

**層位與產地:** 與 *Chusenella douvillei* (Colani), *Chusenella tingi* Chen 等同生於湖南省湘鄉縣壺天,清溪冲灰岩底部。

***Schwagerina megalocula* (新種)**

(圖版 II, 圖 12)

殼為次圓柱形,中部稍凸,兩端圓,長 5.59 毫米,寬 1.88 毫米,有四個頗寬鬆殼圈,內二圈為紡錘形,外二圈為次圓柱形;旋壁薄;隔壁中部平直,兩側下部起低寬褶縐,其兩端部分的褶縐互相接觸構成簡單的粗網狀構造;隔壁高而狹;無旋脊;胎室頗大,往往變形,直徑在 0.32—0.56 毫米之間,外壁頗厚。

**層位與產地:** 湖南省湘鄉縣壺天,清溪冲灰岩。

***Schwagerina longipertica* (新種)**

(圖版 II, 圖 7, 8)

殼小,次圓柱形,中部微凸,兩端圓,長 5.47 毫米,寬 1.42 毫米,有殼圈七,均緊密,內部二、三圈更緊;除最後一圈為次圓柱形外,餘均為長紡錘形;旋壁甚薄,蜂窩組織頗粗;隔壁全面褶縐規則而強烈;在外部殼圈內,緊密的褶縐即於兩端附近亦排列整齊,而兩端區域內的網狀結構不甚複雜;隔壁窄;無旋脊;軸部填充物為長棒狀;胎室為球形,小而壁厚,直徑長 0.14 毫米。

**層位與產地:** 產於湖北省廣濟縣,武穴灰岩及湖南省湘鄉縣壺天,清溪冲灰岩,甚稀少。

***Schwagerina yüi* (新種)**

(圖版 II, 圖 19)

殼為長紡錘形,中部微凸,兩端尖銳,長 5.38 毫米,寬 1.15 毫米,有五緊密殼圈;旋壁甚薄,蜂窩組織細;隔壁下部約三分之二面上起寬圓褶縐,兩端區域結成簡單網狀構造;無旋脊;胎室為球形,直徑約 0.02 毫米。

**層位與產地:** 湖北省廣濟縣,武穴灰岩下部,甚為稀少,與 *Chusenella deprati* Ozawa 同生。

***Schwagerina skinneri* (新種)**

(圖版 II, 圖 13—15)

殼紡錘形,中部凸起甚大,兩端鈍尖,長 5.03 毫米,寬 2.36 毫米,有殼圈八個以上,均為紡錘形而寬鬆;

旋壁薄而軟，蜂窩組織細；隔壁甚薄，僅有近底一小部分起寬圓褶縐，近兩端部分結成簡單網狀構造；隔壁口窄而高；旋脊不發育，僅於胎室壁上留有殘跡；無軸部填充物；胎室為球形，直徑長 0.28 毫米。

**層位與產地：**湖南省湘鄉縣，清溪沖灰岩，與 *Chusenella douvillei* Colani *Chusenella deprati* Ozawa 等共生。

### *Schwagerina tienchiaensis* (新種)

(圖版 III, 圖 1)

殼近紡錘形，中部為圓柱狀，兩端尖細，長 5.86 毫米，寬 2.51 毫米，有六個半殼圈，均緊密，內部三圈尤緊；旋壁薄而軟，蜂窩組織頗粗；隔壁在內部殼圈內者褶縐簡單而不規則，在外部殼圈內者褶縐強烈而緊密；隔壁口甚窄且低；旋脊不存生；軸部填充物大，為不規則圓錐狀，佔殼兩側的大部；胎室為球形，壁厚，直徑 0.26 毫米。

**層位與產地：**湖北省廣濟縣，武穴灰岩；其同生化石為 *Chusenella deprati* Ozawa。

### *Schwagerina exilis* Schwager

(圖版 III, 圖 6, 7)

殼為紡錘形，中部微凸，兩端尖銳，長 5.41 毫米，寬 2.01 毫米，有六殼圈，均為紡錘形，規則而不緊；旋壁薄，蜂窩組織細；隔壁起寬圓褶縐；隔壁口寬；旋脊甚弱，僅見於內部二殼圈內；胎室為次圓形，直徑長約 0.29 毫米。

**層位與產地：**與 *Verbeekina verbeeki* Geinitz 及 *Neoschwagerina douvillei* Ozawa 同產於湖南省湘鄉縣鳳冠山，清溪沖灰岩及廣西省遷江，茅口灰岩中。

### *Schwagerina lingyunensis* (新種)

(圖版 III, 圖 8—10)

殼次圓柱形，長 5.12 毫米，寬 1.92 毫米，有五、六寬鬆殼圈，兩端擴展頗大；旋壁薄；隔壁褶縐強烈而成高縐；無旋脊與填充物；胎室大，為球形，直徑長 0.40 毫米。

**層位與產地：**廣西省凌雲，茅口灰岩產之甚多，與 *Cancellina schellwieni* Deprat 同生。

### *Schwagerina mengi* (新種)

(圖版 V, 圖 1—3)

殼大，短紡錘形，中部膨起甚大，兩端尖銳，長 9.47 毫米，寬 5.62 毫米，具六、七寬鬆殼圈；旋壁甚厚，蜂窩組織頗粗；隔壁頗厚，褶縐強烈，全面均成窄而不甚規則的褶縐；無旋脊；胎室大，為球形，直徑長 0.59 毫米。

**層位與產地：**雲南省寧洱，茅口灰岩，與 *Verbeekina verbeeki* Geinitz 及 *Neoschwagerina craticulifera* Schwager 共生。

### *Schwagerina brevipola* (新種)

(圖版 V, 圖 4—7)

殼小，橢圓形，中部凸起甚規則，兩端小而圓，長 4.46 毫米，寬 2.36 毫米，具七殼圈，第一圈為球形，第二及第三圈為紡錘形，此三圈甚緊密，其餘殼圈為橢圓形而鬆；旋壁薄，蜂窩組織粗；隔壁僅下部縐成低而圓的褶；隔壁口窄而高；旋脊弱小，僅見於內部緊密殼圈內；軸部填充物僅生於內部四殼圈內，為小而不規則塊狀；胎室小，為球形，直徑約 0.14 毫米。

**層位與產地：**湖南省湘鄉縣洪山殿，清溪沖灰岩下部。

***Schwagerina multialveola* (新種)**

(圖版 V, 圖 8)

殼大致為紡錘形,中部頗凸,兩端突出而頂部平截,長 6.93 毫米,寬 3.04 毫米,具九殼圈,內部三、四圈甚緊,其餘各圈頗鬆;內部殼圈的兩端尖,而外部殼圈的兩端擴展成圓形;旋壁薄,蜂窩組織粗;內部三、四殼圈內的隔壁中部平直,兩側部分微縐;中部隔壁起寬圓褶縐;外部隔壁幾完全起強烈褶縐,但不甚規則;隔壁口窄而高;無旋脊;軸部填充物窄而小,僅發生於內部殼圈內;胎室微小,壁薄,直徑約 0.09 毫米。

**層位與產地:** 湖南省湘鄉縣壺天,清溪沖灰岩下部,與 *Sumatrina annae* Volz 共生。

***Schwagerina suni* (新種)**

(圖版 V, 圖 9)

殼次圓柱形,中部微凸,兩端圓,長 6.94 毫米,寬 3.04 毫米,有 8½ 殼圈,第一圈為橢圓形,第二至第五圈為紡錘形,最外三、四圈為次圓柱形;旋壁薄,蜂窩組織細;隔壁褶縐近胎室處低而寬,近兩端處漸變為強烈,在兩端部分者結成寬鬆網狀構造,而最外部數殼圈兩端的網狀結構甚為細密;隔壁口高而窄;旋脊僅存在於內部殼圈,甚微小;胎室小,為球形,直徑長 0.20 毫米。

**層位與產地:** 湖南省湘鄉縣壺天,清溪沖灰岩出產不多,與 *Sumatrina annae* 共生。

***Schwagerina chinensis* (新種)**

(圖版 V, 圖 10)

殼大而鼓起,作紡錘狀,中部凸起甚高,兩端微突而圓,長 10.44 毫米,寬約 4.30 毫米,具七殼圈;旋壁甚薄,蜂窩組織細;隔壁褶縐不規則,兩端部分的褶縐結成不甚細密的網狀構造;隔壁口低而窄;無旋脊;軸部填充物不發達,僅於內部二殼圈內稍有停積;胎室為球形,中型大小,壁厚,直徑長 0.37 毫米。

**層位與產地:** 產於湖北省廣濟縣,武穴灰岩,發現不多。

***Schwagerina hunania* (新種)**

(圖版 III, 圖 11—13)

殼次圓柱形,中部微凸,兩端圓,有 7½ 殼圈,均為次圓柱狀,規則而緊密;旋壁薄,蜂窩組織細;隔壁下部有寬鬆褶縐,近兩端的褶縐互相結合成中型網狀構造;隔壁口甚低而寬;旋脊微小,僅存在於內部三殼圈內;胎室小,球形,壁薄,直徑 0.22 毫米;無軸部填充物。

**層位與產地:** 與 *Sumatrina annae* Volz 同產於湖南省湘鄉縣壺天,清溪沖灰岩。

***Schwagerina yunnanensis* (新種)**

(圖版 IV, 圖 1—3)

殼短,紡錘形,中部凸起甚高,兩端尖鈍,長 7.10 毫米,寬 2.72 毫米,具六、七個紡錘狀殼圈;旋壁薄,蜂窩組織粗;隔壁褶縐強烈而複雜,近兩端的褶縐頗為複雜強烈而緊窄,兩端網狀構造細密;隔壁寬而高;內部五殼圈內軸部填充物成大塊狀;旋脊不存在;胎室為圓球形,中型大小,直徑 0.37 毫米。

**層位與產地:** 雲南省寧洱,茅口灰岩,與 *Verbeekina verbeeki* Geinitz 及 *Neoschwagerina craticulifera* Schwager 共生。

***Schwagerina longitermina* (新種)**

(圖版 IV, 圖 4—6)

殼大,形狀不甚規則,大致為紡錘狀,中部凸起甚高,兩端伸出甚長,末端為圓形,具七個殼圈,長 11.07



毫米，寬 3.57 毫米；內部殼圈具尖端，為紡錘形，外部殼圈的兩端伸長而擴展；旋壁薄，蜂窩組織粗；隔壁褶綫強烈而複雜，兩端褶綫結成複雜圓形網狀構造；隔壁口為長縫狀；無旋脊；軸部填充物在內部三殼圈內成不規則圓錐狀小體；胎室通常為球形，少數為腎形，壁厚，直徑長 0.26 毫米。

**層位與產地：**與 *Chusenella douvillei* (Colani) 同產於湖南省湘鄉縣壺天，清溪沖灰岩。

### *Schwagerina hupehensis* (新種)

(圖版 VIII, 圖 1--3)

殼為長次圓柱狀，微彎，中部稍凸，兩端鈍圓或平截，長 11.18 毫米，寬 2.51 毫米，具七殼圈，內三、四圈緊密，外殼圈較鬆，最外殼圈的兩端通常伸展甚長；旋壁薄，蜂窩組織細；內部隔壁不褶綫，中部隔壁僅下部有低褶綫，外部隔壁的褶綫強烈而緊密；外殼圈兩端內的網狀構造甚為細密；隔壁口低而寬；旋脊雖弱小，但伸展至第五或第六殼圈；軸部填充物僅於內部二、三殼圈內稍有停積；胎室小，為圓球形，直徑長 0.23 毫米。

**層位與產地：**湖北省廣濟縣田家鎮，武穴灰岩。

### *Schwagerina pactiruga* (新種)

(圖版 VIII, 圖 4,5)

殼中部微凸，為圓柱狀，兩側為圓錐形，末端略平截，具八殼圈，內三緊密殼圈為紡錘狀，其餘殼圈逐漸放寬且兩端伸長並擴展而成為次圓柱形；旋壁薄，蜂窩組織細；內部隔壁不褶綫，中部隔壁有微綫，外部隔壁的褶綫緊密，同時兩端的網狀構造亦複雜而細密；隔壁口在內殼圈內者窄，在外殼圈內者寬；旋脊僅生於內部三殼圈內，甚微弱；軸部填充物不規則，僅停積於內部五殼圈內；胎室微小，為球形，直徑約 0.17 毫米。

**層位與產地：**湖南省湘鄉縣壺天，清溪沖灰岩。

### *Schwagerina granum-avenae* Roemer

(圖版 VIII, 圖 6—10)

殼有二型；小胎室殼為次圓狀，微彎曲，中部略凸，兩端圓或平截，長 12.66 毫米，寬 3.34 毫米，具八、九殼圈，少數有 10 殼圈，緊而規則。大胎室殼為長紡錘形，中部凸起甚高，兩端圓，有  $7\frac{1}{2}$  殼圈，均為紡錘形，緊而規則；長 7.25 毫米，寬 2.69 毫米。旋壁薄，蜂窩組織細；隔壁中部褶綫低而寬，褶綫強度向兩端漸增，至兩端區域互相扭成複雜網狀構造；隔壁低而寬；旋脊不存在；軸部填充物不發育或全付缺如；胎室微小，為球形，直徑 0.20 毫米。

**層位與產地：**湖北省廣濟縣田家鎮，武穴灰岩下部，與 *Chusenella deprati* Ozawa 及 *Chusenella douvillei* 共生。

## 朱森筳屬 *Chusenella* Hsu, 1942, emed. Chen, 1955

### 屬型 *Chusenella ishanensis* Hsu, 1942

殼中等大小，紡錘形，有時中部凸起，兩端尖銳。胎室小為球形。內部二至四殼圈非常緊密，外部殼圈鬆而寬。旋壁薄，為緻密層與蜂窩層所組成。內部緊密殼圈內的隔壁不起褶綫，而外部殼圈內的隔壁褶綫強烈而緊密。通道單一旦位於中部。旋脊僅存在於內部緊密殼圈內，且甚微弱，有時竟不存在；外部殼圈內完全無旋脊。軸部填充物發生於胎室附近。

朱森筳屬名為李四光教授於 1942 年所創立，但未給以屬型，且未列出該屬所屬的種。徐煜堅君於同一年份在同一刊物上發表一篇文章記述朱森筳宜山種 (*Chusenella ishanensis* Hsu)，並指定該種為朱森筳的屬型。根據國際動物命名規則第 25 條，徐君應為該屬名的創立者，湯姆生亦已論及此事。

自該屬名發表後引起各國學者對該屬的意見。作者最近將該屬的標準薄片加以詳細觀察，發現所謂分枝的或穿孔的似旋脊實為甚緊密的隔壁褶綫頂端的切面，而非真正的似旋脊。再者，徐君插圖中的橫切面，

根據該圖的化石薄片觀察，其各種構造與插圖中軸切面大不相同。該橫切面的殼圈自內向外放寬頗為規則，不像軸切面的內部三、四殼圈非常緊密而外部殼圈寬鬆。最重要的，旋壁構造二者完全不同。軸切面的旋壁僅有二層，外為緻密層，內為蜂窩層。而橫切面的旋壁有三層，外為緻密層，中為細蜂窩層，內為疏鬆層。因此該橫切面不屬於朱森錠而屬於米氏錠的一種。所以朱森錠的特徵必須加以修正。

### *Chusenella tingi* (新種)

(圖版 II, 圖 1—3)

殼為規則紡錘形，中部凸起甚高，兩端細尖，長 4.05 毫米，寬 1.77 毫米，有八個殼圈，內部三圈特別緊密，外部殼圈稍鬆；旋壁甚薄，蜂窩組織頗粗；首三殼圈內的隔壁幾無褶縐，中部隔壁的下部起頗規則褶縐，外部隔壁褶縐不甚規則；隔壁口低而窄；旋脊微弱，生於內部數殼圈內；軸部填充物狹而長；胎室性質不詳。

**層位與產地：**與 *Chusenella deprati* Ozawa 同產於湖南省湘鄉縣壺天，清溪沖灰岩下部。

### *Chusenella deprati* Ozawa

(圖版 II, 圖 16—18)

殼紡錘形，中部凸起甚高，兩端尖鈍，長 6.09 公厘，寬 2.69 公厘，有七、八殼圈，均為規則紡錘形，內部三殼圈極緊密，外部殼圈較鬆；旋壁極薄，蜂窩組織頗粗；內部緊密殼圈內的隔壁幾平直，外部殼圈內的隔壁褶縐規則；隔壁口窄而高；旋脊微弱，僅存在於內部殼圈；軸部填充物不規則；胎室為球形，甚微小。

**層位與產地：**產於湖南省湘鄉縣，清溪沖灰岩及湖北省廣濟縣，武穴灰岩。在清溪沖灰岩中，個體甚多，且與 *Chusenella douvillei* (Colani), *Verbeekina verbeeki* Geinitz, *Neoschwagerina craticulifera* 及 *Sumatrina annae* Volz 共生。

### *Chusenella conicocylindrica* (新種)

(圖版 IV, 圖 7,8)

殼中型大小，中部短為圓柱形，兩端長為圓錐形，長 6.57 毫米，寬 2.34 毫米，具 9½ 殼圈；內四圈為次圓柱形，非常緊密，其高度幾與旋壁厚度相等；外部殼圈為圓柱形，較寬鬆；最後二、三殼圈的兩端向外伸展甚長；旋壁甚薄，蜂窩組織細；內部隔壁幾平直，中部隔壁的下部起規則褶縐，外部隔壁全面起強烈而緊密褶縐；兩端網狀結構甚細；隔壁口低而窄；無旋脊；軸部填充物僅於中部殼圈內成不規則的錐狀體；胎室微小，為圓球形，直徑長約 0.09 毫米。

**層位與產地：**湖南省湘鄉縣壺天鎮，清溪沖灰岩。

### *Chusenella douvillei* (Colani)

(圖版 III, 圖 2—5)

殼頗大，為短紡錘形，中部凸起甚高，兩端尖鈍，長 7.07 毫米，寬 3.18 毫米，有八、九個殼圈，內部三、四圈極緊密，外部殼圈寬鬆；旋壁薄，蜂窩組織粗而鬆；隔壁在內部三殼圈內者不甚褶縐，在外部殼圈內者褶縐強烈而規則；其近殼端部分成結成細網狀構造；旋脊微小，僅存在於內部三殼圈內；隔壁口低而窄；軸部填充物小而不規則；胎室微小，為球形，直徑長約 0.17 毫米。

**層位與產地：**產於湖南省湘鄉縣，清溪沖灰岩及湖北，廣濟，武穴灰岩與京山縣刀脊山相同石灰岩中；在清溪沖灰岩中與 *Verbeekina verbeeki* Geinitz 及 *Neoschwagerina craticulifera* 共生。

似希氏筴屬 *Paraschwagerina* Dunbar & Skinner, 1936屬型 *Paraschwagerina gigantella* (White) = *Schwagerina gigantella* White, 1932*Paraschwagerina shengi* Chen (新種)

(圖版 VI, 圖 1—4)

殼大而短，爲紡錘形，中部凸起甚高，兩端圓，長 7.69 毫米，具  $6\frac{1}{2}$  殼圈，亦有具  $8\frac{1}{2}$  殼圈者；殼圈三個演變期甚清晰，首三圈甚緊，第四圈開始時即突然放寬，並維持至最後前一殼圈，末一殼圈的高度又降低；旋壁甚薄，僅下部有寬褶縐；兩端部分縐成粗疏網狀構造；無旋脊發現；隔壁口窄而低；胎室小，爲圓球形，有時爲腎形，直徑長 0.31 毫米。

層位與產地：產於湖南省湘鄉縣鳳冠山，清溪沖灰岩及湖北省廣濟縣，武穴灰岩。

韋氏筴亞科 *Verbeekinae* Staff & Wedekind, 1910韋氏筴屬 *Verbeekina* Staff, 1909屬型 *Verbeekina verbeeki* (Geinitz) = *Fusulina verbeeki* Geinitz, 1876

殼似球形，具許多殼圈；旋壁爲緻密層與蜂窩層所組成，有時蜂窩層下有一暗色薄層，似爲內疏鬆層；隔壁不褶縐；似旋脊不完全，在內部幼殼內發育完善，中部殼圈內或付缺如或不甚發育，但於外部殼圈內又行出現；隔壁下緣有一列圓形小孔；胎室微小。

*Verbeekina verbeeki* Geinitz

(圖版 IX, 圖 5, 6; 圖版 XIII, 圖 1, 2)

殼爲球形，有 12 殼圈，長 10.95 毫米，寬 8.67 毫米；殼圈緊密；旋壁與隔壁均薄；隔壁上無中央長形口，而其下緣一列小孔爲似圓形；似旋脊發育不完全；胎室微小，爲球形，直徑長約 0.05 毫米。

層位與產地：產於湖北省廣濟縣，武穴灰岩；湖南省湘鄉縣壺天及鳳冠山，清溪沖灰岩；廣西省舊遷江、合山、扶南、綏綠、河池等縣及貴州省劉堡的水城，茅口灰岩。

*Verbeekina verbeeki sphaera* Ozawa

(圖版 IX, 圖 11, 12)

殼小，圓球形，長 2.48 毫米，寬 2.16 毫米，有七、八個緊密殼圈；旋壁薄；隔壁薄而平直；似旋脊低而寬，斷續出現；隔壁下緣小孔細，爲似圓形；胎室未見及。

層位與產地：與 *Cancellina schellwieni* Deprat 同產於廣西省上金與凌雲二縣的茅口灰岩。

*Verbeekina ellipsoidal* (新種)

(圖版 IX, 圖 1—4)

殼橢圓形，中部稍凸，兩端圓，長 6.24 毫米，寬 4.77 毫米，具 13 殼圈，內三圈甚緊密，其餘殼圈稍鬆；旋壁構造與屬型相同；隔壁幾平直，短而厚；似旋脊不發育，內部殼圈內亦無之，其存在於外部殼圈內者間隔頗遠，而高，寬亦不一致；隔壁下緣小孔有時爲似圓形，有時爲長方形；胎室極微小。

層位與產地：盛產於廣西省上金縣，茅口灰岩，與 *Verbeekina verbeeki* Geinitz 及 *Cancellina schellwieni* Deprat 同生。

*Verbeekina crassispira* (新種)

(圖版 IX, 圖 7—10)

殼圓球形，軸長略大於寬，長 5.87 毫米，寬 5.38 毫米，有殼圈 13；內三、四圈較外圈爲緊，所有殼圈均比

*Verbeekina verbeeki* Geinitz 的殼圈爲緊密；旋壁頗厚，蜂窩組織極細；隔壁不褶縐，在內部殼圈內者甚薄，似僅爲緻密層所構成，其在外部殼圈內者短而厚，有三層，中央爲緻密層，兩側爲蜂窩層；隔壁下緣小孔爲橢圓形；似旋脊發育於內部與外部殼圈內，中部殼圈內未見之；胎室未見。

層位與產地：與 *Cancellina schellwieni* Deprat 同產於廣西省江明縣，茅口灰岩。

### 米氏筵屬 *Misellina* Schenck & Thompson, 1940

屬型 *Misellina lepida* (Schwager) = *Schwagerina lepida* Schwager

殼橢圓形或圓柱形；旋壁薄，有緻密，蜂窩及內疏鬆三層；隔壁平直，下緣有一列小孔而無中央長形口；似旋脊發育完善；胎室微小。

分佈：二疊紀。

#### *Misellina lepida* (Schwager)

(圖版 VI, 圖 5—8)

殼大，短圓柱狀，長 6.42 毫米，寬 4.85 毫米，具 18 殼圈，首二圈爲凸鏡狀，中部殼圈爲紡錘形，外部殼圈爲圓柱形，所有殼圈均緊密；旋壁薄，蜂窩組織甚細；隔壁短而厚，其下緣粗而緻密；似旋脊發育完善；隔壁下緣小孔微小，爲似圓形；胎室小，爲球形，直徑約 0.11 毫米。

層位與產地：湖南省湘鄉縣，清溪沖灰岩及湖北省，廣濟縣，武穴灰岩產之甚多。我國西南各省茅口灰岩亦盛產之。

#### *Misellina major* Deprat

(圖版 VI, 圖 9—11)

殼大，橢圓形，中部凸起均勻，兩端渾圓，長 8.34 毫米，寬 5.53 毫米，具 14 殼圈，均規則而緊密；旋壁薄，有三層；隔壁較薄，其下緣小孔爲次圓形；似旋脊發育完善，在內部殼圈中者其橫切面爲長方形，在外部殼圈內者爲三角形；胎室未詳。

層位與產地：湖南省湘鄉縣，清溪沖灰岩；在此層中無他種筵化石與之共生。

#### *Misellina compacta* (新種)

(圖版 IV, 圖 9—11)

殼小，圓柱形，長約 4.83 毫米，寬約 2.33 毫米，具 12 個以上殼圈，均爲圓柱形，規則而緊密；旋壁薄；隔壁短而厚；似旋脊低而寬，橫切面爲次三角形；複隔壁口細，次圓形，彼此隔離頗遠。胎室小，爲球形。

層位與產地：湖北省廣濟縣，武穴灰岩，與 *Misellina lepida* Schwager 及 *Chusenella douvillei* 共生。

### 假米氏筵屬 *Pseudodoliolina* Yabe & Hanzawa, 1932

屬型 *Pseudodoliolina ozawai* Yabe & Hanzawa, 1932

殼圓柱形，兩端微凸，殼圈多而緊；旋壁僅有一緻密層；隔壁短而厚；似旋脊發育不規則，大小，高低不齊一；複隔壁口多；胎室小。

分佈：亞洲，二疊紀。

#### *Pseudodoliolina ozawai* Yabe & Hanzawa

(圖版 IV, 圖 12—14)

殼圓柱形，兩端圓，長 5.12 毫米，寬 2.10 毫米，有 12 殼圈；殼有二型；小胎室殼較長，殼圈較多而緊；大胎室殼較短，殼圈較少而較鬆；旋壁甚薄而柔軟；隔壁厚度與旋壁相似；複隔口多而細，次圓形；似旋脊高；胎

室爲球形，小胎室直徑 0.14 毫米，大胎室直徑 0.27 毫米。

**層位與產地：**湖南省湘鄉縣壺天，清溪沖灰岩下部及廣西省河池，茅口灰岩產之甚多。

### 新希氏鏟亞科 *Neoschwagerininae* Dunbar & Condra, 1928

#### 格子鏟屬 *Cancellina* Hayden, 1909

**屬型** *Cancellina primigenia* (Hayden) = *Neoschwagerina primigenia* Hayden, 1909

殼紡錘形；殼圈緊密；旋壁爲緻密層與蜂窩層組成，僅有第一副隔壁而無第二副隔壁，或於生長最後時期稍行出現。

#### *Cancellina schellwieni* Deprat

(圖版 XII, 圖 1—3)

殼中型大小，紡錘形，中部凸起規則，兩端圓，長約 3.00 毫米，寬約 1.77 毫米，具七個殼圈，均緊密；旋壁薄，緻密層頗厚，而蜂窩層甚薄，幾至難辨；隔壁薄，其下緣通常指向前方；第一直副隔壁出現頗早，一個或二個夾於一對隔壁之間；第一橫副隔壁厚薄不規則，與似旋脊相對且往往與之相連結；第二橫副隔壁僅發生於最外部殼圈內，而且甚短，與第一橫副隔壁相間而生；複隔壁口細而次圓；胎室大，圓球形，直徑在 0.30—0.35 毫米之間。

**層位與產地：**廣西省崇善縣與興城縣，茅口灰岩中發現頗多，與 *Verbeekina verbeeki* Geinitz 及 *Neoschwagerina simplex* Ozawa 共生。

#### 新希氏鏟屬 *Neoschwagerina* Yabe, 1903

**屬型** *Neoschwagerina craticulifera* (Schwager) = *Schwagerina craticulifera* Schwager, 1883

殼大，紡錘形；殼圈多而緊；旋壁有二層，外爲緻密層，內爲蜂窩層；隔壁有三層，中爲緻密層，前後各爲蜂窩層；第一直副隔壁一個至三個插於兩個隔壁之間，第二副隔壁與第一直副隔壁相間而生；第一橫副隔壁與似旋脊相連；第二橫副隔壁與第一橫副隔壁相間；隔壁與第一副隔壁下緣均有一列圓孔；似旋脊爲細螺線狀；胎室一般微小，但亦有稍大者。

**分佈：**亞洲，二疊紀。

#### *Neoschwagerina simplex* Ozawa

(圖版 XII, 圖 13—16)

殼型較小，紡錘狀，中部稍凸，兩端鈍尖，長 4.64 毫米，寬 2.96 毫米，具 10 殼圈，均緊密而規則，內二圈爲球形，其餘殼圈爲紡錘形；旋壁厚，緻密層薄而蜂窩層厚；第一直副隔壁頗厚，第二直副隔壁初出現於第四殼圈，與隔壁相間而生；第一橫副隔壁厚而短，與似旋脊相連；無第二橫副隔壁；複隔壁口爲圓形；似旋脊粗而高；胎室小，圓球形，直徑 0.17 毫米。

**層位與產地：**廣西省崇善縣及興城縣，茅口灰岩。其共生化石爲 *Verbeekina verbeeki* Geinitz。

#### *Neoschwagerina craticulifera* Schwager

(圖版 XII, 圖 10—12)

殼爲紡錘形，中部凸起，兩端尖銳，長 5.38—6.38 毫米，寬 3.25—3.50 毫米，軸率爲 1:1.7。殼圈緊而規則，數達 13 至 14 個。

旋壁薄，爲緻密層與蜂窩層所組成，蜂窩組織甚細。

軸隔壁短，其下端緻密而色暗，且向前彎。軸副隔壁初出現於第五殼圈中，每一對隔壁間有一個副隔壁；隔壁間的副隔壁以後逐漸增加至 2—3 個。



橫副隔壁發育良好，一般底部較寬，向末端漸薄，其末端與似旋脊相接。第二橫副隔壁不發達，僅在最外部殼圈中以短脊狀出現。

複隔壁口多而細，為似圓形。似旋脊細，為半圓脊狀。胎室小，為球形，大者直徑約 0.20 毫米，小者直徑僅 0.04—0.08 毫米。

**層位與產地：**發現於湖北省廣濟縣，武穴灰岩與湖南省湘鄉縣，清溪沖灰岩中。

### *Neoschwagerina douvillei* Ozawa

(圖版 XIII, 圖 3—7; 圖版 XIV, 圖 7)

殼紡錘狀，中部微凸，兩端尖，長 5.98 毫米，寬 3.28 毫米，具 15½ 殼圈，內三、四圈為球形，其餘為紡錘形；旋壁甚薄；隔壁薄而軟，下部暗色緻密部分向前彎；直副隔壁短，僅及室高之半，於第一殼圈內即行出現，初與隔壁一一相間，以後每二隔壁間逐漸增加至 3—4 個；第一橫副隔壁薄，而厚度頗均勻，第二橫副隔壁短，僅發生於外部殼圈內；複隔壁口為扁圓形；似旋脊細而低；胎室為圓球形，頗大，直徑 0.35 毫米。

**層位與產地：**廣西省遷江，茅口灰岩產之甚富，與 *Chusenella douvillei* Colani, *Neoschwagerina megalospherica* Deprat 及 *Sumatrana annae* Volz 共生。湖南省湘鄉縣鳳冠山，清溪沖灰岩也有出產，但為數不多。

### *Neoschwagerina colaniae* Ozawa

(圖版 XIV, 圖 1—4)

殼中等大小，頗圓，長 3.25 毫米，寬 2.54 毫米，具 13 殼圈，均緊密而規則；旋壁薄；隔壁薄而軟，厚度不固定，向下漸薄；直副隔壁不甚發育，僅存在於外部殼圈內，與隔壁一一相間而生；橫副隔壁薄而軟，微彎曲，與似旋脊相接連，無第二橫副隔壁；複隔壁口為次圓形；胎室微小，作球形，直徑僅 0.07 毫米。

**層位與產地：**與 *Sumatrana annae* Volz 同產於湖南省湘鄉縣，清溪沖灰岩。

### *Neoschwagerina multircumvoluta* Deprat

(圖版 XIV, 圖 5, 6)

殼短紡錘形，中部高凸，兩端圓，具 18½ 殼圈，長 4.02 毫米，寬 3.27 毫米，間有具 20 殼圈者；內部二圈的軸向與其他殼圈的軸向不一致，而以大角度相交；所有殼圈均為紡錘形而緊密；旋壁薄，有緻密及蜂窩二層；隔壁甚薄，其下緣結實而色暗；直副隔壁厚度與隔壁相似，初出現時彼此相間，以後每二隔壁間，副隔壁增加至二個或三個；第一橫副隔壁頗厚，其下緣與似旋脊相連；無第二橫副隔壁；複隔壁口為次圓形；似旋脊為半圓螺線狀；胎室為圓球形，極微小。

**層位與產地：**湖南省湘鄉縣壺天，清溪沖灰岩上部，與 *Neoschwagerina craticulifera* Schwager 同生。

### *Neoschwagerina leei* (新種)

(圖版 XI, 圖 1—6)

殼近圓形，中部凸起甚高，兩端圓，具 27—28 殼圈，長 6.86 毫米，寬 5.62 毫米，全部殼圈均規則而緊密；旋壁甚薄，為緻密層與蜂窩層所組成；隔壁薄而軟，一般向前斜；直副隔壁柔軟，初出現時，與隔壁一一相間，以後每二隔壁間增加至 2—3 個；第一橫副隔壁薄而微曲；無第二橫副隔壁；複隔壁口在殼的內部者為圓形，在外部者為長圓形；似旋脊甚細；胎室微小，為球形，直徑約 0.10 毫米。

**層位與產地：**湖南省湘鄉縣壺天鎮，清溪沖灰岩。與 *Chusenella douvillei* Colani, *Verbeekina verbeeki* Geinitz 及 *Sumatrana annae* Volz 為伴。

### *Neoschwagerina margaritae* Deprat

(圖版 X, 圖 1—3)

殼短紡錘形，中部凸起甚高，兩端圓，長 5.28 毫米，寬 4.11 毫米，具 17 殼圈，均緊密而規則，內部三圈為

球形，中部七、八圈為橢圓形，外部數圈為紡錘形；旋壁薄，蜂窩層發育至最外一殼圈；隔壁薄；直副隔壁初出現時成低脊狀，與隔壁一一相間，以後逐漸增加至 3—4 個間於二隔壁之中；第一橫副隔壁薄而直，與似旋脊相對；無第二橫副隔壁；複隔壁口為次圓形；似旋脊為尖頂螺線狀；胎室小，為球形，直徑長約 0.10 毫米。

**層位與產地：**湖北省廣濟縣，武穴灰岩及湖南省湘鄉縣鳳冠山，清溪灰岩均產之；廣西省遷江架馬，茅口灰岩中亦有發現。

### *Neoschwagerina megaspherica* Deprat

(圖版 X, 圖 4—8)

殼大，為紡錘形，中部很凸，兩端尖，中部與兩端之間的傾斜部分往往微凹。軸長約 7.63 毫米，殼的中部直徑約 3.57 毫米；軸率為 1:2.1。首三殼圈為球形，以後的殼圈逐漸變為紡錘形。全部殼圈均緊密。殼圈數達 16—19。

旋壁很薄，為緻密層與蜂窩層所構成。

軸隔壁極薄，末端緻密而色暗。軸副隔壁厚度與隔壁相似，但甚短，且長短不一致。軸副隔壁初出現於第二殼圈中，以一副隔壁夾於二個隔壁中；二隔壁間的副隔壁逐漸增加；在最外數殼圈中，副隔壁增至四或五個。

第一橫副隔壁在內部殼圈中者厚度頗為規則，在外部殼圈中者頗不整齊，其下端與似旋脊相接。第二橫副隔壁甚短，每二個第一副隔壁間僅有一個第二副隔壁。

隔壁複口多而細，為似圓形。似旋脊一般為次三角脊狀。胎室大，壁薄，通常為不整齊圓球形，直徑約 0.77 毫米。

**層位與產地：**這個種類在廣西省遷江，茅口灰岩產之頗多，往往與 *Neoschwagerina douvillei* Ozawa 伴生。

### 矢部筳屬 *Yabeina* Deprat, 1914

屬型 *Neoschwagerina* (*Yabeina*) *inouyei* Deprat = *Neoschwagerina globosa*

*Yabe* = *Yabeina globosa* (*Yabe*), 1914

殼短，紡錘形或球形；殼圈緊密；旋壁為緻密層與蜂窩層所組成；正隔壁，直副隔壁第一與第二橫副隔壁均發育，且上半部透明而下半部緻密；複隔壁口為一系列圓形小孔；似旋脊細，與第一橫副隔壁相連；胎室小或大。

### *Yabeina shiraiwensis* Ozawa

(圖版 XIV, 圖 8—10)

殼長紡錘狀，略略彎曲，中部稍凸，兩端鈍尖，通常具 13 殼圈，有具 17 殼圈者，長 8.34 毫米，寬 3.27 毫米，殼圈均緊密，內部 2—3 圈為球形，其餘各圈漸變為紡錘形；旋壁甚薄；隔壁薄而軟，下部一般膨大而緻密；直副隔壁初出現於第二殼圈或第一殼圈的後部，與正隔壁相間，以後漸增至四或五個夾於二正隔壁之間，其下部亦稍膨大；第一橫副隔壁薄而軟，厚薄不一致；第二橫副隔壁短，發生於外部殼圈內，與第一副隔壁相間；複隔壁口為次圓形；似旋脊窄而高，與第一橫副隔壁相接連；胎室為球形，直徑長約 0.44 毫米。

**層位與產地：**與 *Chusenella douvillei* Colani, *Chusenella deprati* Ozawa 及 *Sumatrana annae* Volz 共生於湖南省湘鄉縣壺天，清溪沖灰岩。此種亦盛產於湖北省廣濟縣，武穴灰岩，與 *Chusenella douvillei* Colani 及 *Neoschwagerina craticulifera* Schwager 同生。

### *Yabeina inouyei* Deprat

(圖版 XI, 圖 7, 8)

殼大，短紡錘形，中部很凸，兩端圓，具 18—20 殼圈，均緊密而規則，長 8.10 毫米，寬 5.03 毫米；旋壁甚

薄；隔壁下部緻密而向前彎；直副隔壁長短，厚薄不整齊，初出時以一個或二個與正隔壁相間，後增至三個或四個插於二正隔壁之間；第一橫副隔壁特別薄，其在外殼圈內者尤薄；第二橫副隔壁存在於外部殼圈內，長僅及第一副隔壁之半，且與之相間；複隔壁口次圓形；似旋脊細，在內部殼圈內發育完善，至外部殼圈則漸漸退化；胎室未見及。

**層位與產地：**與 *Sumatrina annae* Volz 同產於湖南省湘鄉縣，清溪沖灰岩。

### *Yabeina proboscis* (新種)

(圖版 XIII, 圖 8—10)

殼為不規則長紡錘形，中部凸起頗高，兩端伸展甚長且彎曲作象鼻狀，具 17 緊密殼圈，長 9.05 毫米，寬 2.96 毫米；旋壁甚薄，蜂窩層亦薄；隔壁薄而軟；直副隔壁下部緻密而色暗，在外部殼圈內三副隔壁與一隔壁相間而生；第一橫副隔壁甚薄，與似旋脊相對；第二橫副隔壁不發育，有時僅成短突起間於第一副隔壁之間；複隔壁口為次圓形；似旋脊為細螺線狀；胎室中等大小，為圓球形，直徑約 0.20 毫米。

**層位與產地：**廣西省遷江，茅口灰岩。

### *Yabeina* sp.

(圖版 VII, 圖 12)

此筵在吾們所採集標本中甚為少見，僅得一近似橫切面，露出 15 殼圈，寬 3.16 毫米。內部數殼圈的旋壁有發育不全的蜂窩層，其他殼圈的旋壁完全缺少此層。內部殼圈中的正隔壁與直副隔壁的上部亦有時尚未完全固結；此外所有正隔壁與副隔壁均緻密而彎曲。

**層位與產地：**與 *Neoschwagerina douvillei* Ozawa 共生於廣西省遷江，茅口灰岩中。

## 阿富汗筵屬 *Afghanella* Thompson, 1946

### 屬型 *Afghanella schencki* Thompson, 1946

#### *Afghanella schencki* Thompson, 1946

(圖版 XII, 圖 4—9)

殼小，橢圓形，具 10 殼圈，緊密而整齊，長 3.73 毫米，寬 2.51 毫米；旋壁薄；隔壁頗厚，下部緻密而色黑；直副隔壁短，僅發生於外部殼圈內，與正隔壁相間；第一橫副隔壁的上部薄，下部膨大與似旋脊相接連；第二橫副隔壁短，初出現於第五殼圈內，與第一橫副隔壁一一相間；複隔壁口為次圓形；似旋脊略粗，底部向兩側延展且互相連接；胎室小，為球形，直徑約 0.24 毫米。

**層位與產地：**廣西省崇善縣，茅口灰岩。

#### *Afghanella sumatrinaeformis* Gubler

(圖版 VII, 圖 9—11)

殼大，紡錘形，中部高凸，兩端圓，具 12 緊密殼圈，長 8.61 毫米，寬 4.61 毫米；內部三、四殼圈為圓球形，外部殼圈為紡錘形；旋壁很薄，緻密層及蜂窩層均甚清晰；隔壁薄；直副隔壁上部透明，下部膨大而緻密，初出現時與正隔壁一一相間，以後二個、三個甚至四個副隔壁與一隔壁相間排列；第一橫副隔壁短，僅及殼室高的一半，上部透明，下部膨大而緻密；第二橫副隔壁甚短，通常一或二個與第一副隔壁相間而生；複隔壁為次圓形；似旋脊甚細；胎室大，圓球形，直徑 0.62 毫米。

**層位與產地：**雲南省寧洱，茅口灰岩產之頗多，與 *Verbeekina verbeeki* Geinitz 及 *Neoschwagerina* sp. 共生。



**蘇門答臘筳屬 *Sumatrina* Volz, 1904****屬型 *Sumatrina annae* Volz, 1904**

殼長紡錘形或次圓柱形；旋壁為緻密層與粗蜂窩層所組成，窩壁緻密而下緣往往粗厚；正隔壁厚而長；橫副隔壁平直而緻密，下端與似旋脊相連；似旋脊微細；胎室頗大。

***Sumatrina annae* Volz**

(圖版 VII, 圖 7, 8)

殼長紡錘形，具 7 殼圈，頗寬緩，長約 4.10 毫米，寬約 1.60 毫米；旋壁頗厚，緻密層頗粗；隔壁相距頗遠，下部膨大；橫副隔壁的下緣粗；似旋脊細；複隔壁口為橢圓形；胎室為球形，直徑 0.26 毫米。

層位與產地：產於湖南省湘鄉縣壺天，清溪沖灰岩；湖北省廣濟縣，武穴灰岩；及廣西省崇善，茅口灰岩。

***Sumatrina longissima* Deprat**

(圖版 VII, 圖 4—6)

殼次圓柱形，兩端圓，中部有時微凸，具 9 或 10 殼圈；長 5.59 毫米，寬 1.62 毫米；旋壁頗厚，蜂窩組織粗，隔壁下緣膨大；橫副隔壁排列頗稀疏，下緣粗厚，與似旋脊相對且往往與之相連；複隔壁口為一系列橢圓形小孔；胎室頗大，壁厚，形狀頗多變化；為圓球形時，直徑約 0.28 毫米。

層位與產地：湖南省湘鄉縣壺天，清溪沖灰岩產之甚多，與 *Verbeekina verbeeki* Geinitz 及 *Sumatrina annae* Volz 共生。

**參 考 文 獻**

- [1] Chen, S. (陳旭), 1934. A New species of Fusulinidae from the Meitien Limestone: *Bull. Geol. Soc. China* **13**, (2), 237—242, pl. 1.
- [2] ———, 1934. Fusulinidae of South China, Part I: China Geol. Survey, *Palaeontologia Sinica*, ser. B, vol. **4**, fasc. 2, p. 1—185, pls. 1—16.
- [3] Colani, M., 1924. Nouvelle contribution a l'etude des Fusulinidés de l'Extrême-Orient: *Mém. Serv. Géol. l'Indochine*, vol. **11**, fasc. 1, pp. 1—191, pls. 1—29, graphs 1—28.
- [4] Deprat, J., 1912. Étude des Fusulinidés de Chine et l'Indochine et classification des calcaires à fusulines: *Mém. Serv. Géol. l'Indochine*, vol. **1**, fasc. 3, p. 1—76, pls. 1—9.
- [5] Dunbar, C. O. & Skinner, J. W., 1936. Schwagerina vs. Pseudoschwagerina and Paraschwagerina: *Jour. Palaeontology*, **10**, 83—91, pls. 10, 11.
- [6] ———, 1937. The Geology of Texas. Volume III, Part 2, Permian Fusulinidae of Texas: *Texas Univ. Bull.* 3701, p. 517—825, pls. 42—81.
- [7] Gubler, J., 1935. Les Fusulinidés du permien de l'Indochine, leur structure et leur classification: *Mém. Soc. Geol. France*, new ser., tome 11, fasc. 4, No. 26, p. 1—173, pls. 1—8 (18—24).
- [8] Hayden, H. H., 1909. Fusulinidae from Afghanistan: *Records Geol. Survey, India*, **38**, 230—256, pl. 17—22.
- [9] Hsu, Y. C. (徐煜堅), 1942. On the Type Species of Chusenella: *Bull. Geol. Soc. China*, **22**, 174, 175, text-figs. 1, 2.
- [10] Lee, J. S. (李四光), 1924. Fusulinidae of North China: China Geol. Survey, *Palaeontologia Sinica*, ser. B, vol. 4, fasc. 1, p. 1—172, pls. 1—24.
- [11] ———, 1933. Taxonomic Criteria of Fusulinidae with Notes on Seven New Permian Genera: *Nat. Mem. Research Inst. Geology*, No. 14, p. 1—32, pls. 1—5.
- [12] ———, 1942. Note on a New Fusulinid Genus, Chusenella: *Bull. Geol. Soc. China*, vol. **22**, p. 171—173.
- [13] Ozawa, Y. (大澤), 1925. On the Classification of Fusulinidae: Tokyo Imp. Univ., *Jour. Coll. Sci.*, vol. 45, art. 4, p. 1—26, pls. 1—4.
- [14] Ozawa, Y., 1925. Palaeontological and Stratigraphical Studies on the Permo-Carboniferous Limestone of Nagato. Part II. Palaeontology: *Tokyo Imp. Univ., Jour. Coll. Sci.*, vol. **45**, art. 6, p. 1—90, pls. 1—14.
- [15] ———, 1927. Stratigraphical Studies of the Fusulina Limestone of Akasaka, Province of Mino: Tokyo Imp. Univ., *Jour. Fac. Sci.*, sec. 2, vol. **2**, pt. 3, p. 121—164, pls. 34—45.
- [16] Ozawa, Y., & Tobler, A., 1929. Permian Fusulinidae Found in Greece: *Eclogae geol. Helvetiae*, **22**, 45—49, pl. 5.
- [17] Schellwien, E., 1898. Die Fauna des karnischen Fusulinenkalks. Teil II. Foraminifera: *Palaeontographica*, **44**, 237—282, pls. 17—24.
- [18] Schellwien, E., 1908. Monographie der Fusulinen. Teil I: Die Fusulinen des russisch-arktischen Meeresgebietes: *Palaeontographica* **55**, 145—194, pls. 13—20.

- [19] Schellwien, E., & Dyhrenfurth, G., 1909. Monographie der Fusulinen Teil. II: Die asiatischen Fusulinen. A. Die Fusulinen von Darwas: *Palaeontographica*, **56**, 137—176, pls. 13—16.
- [20] Schenck, H. G., & Thompson, M. L., 1940. Misellina and Brevaxina, New Permian Fusulinid Foraminifera: *Jour. Palaeontology*, **14**, 584—589.
- [21] Schwager, C., 1883. Carbonische Foraminiferen aus China und Japan: Von Richthofen's *China*, **4**, p. 106—159, pls. 15—18.
- [22] Staff, H. von, 1909. Beiträge zur Kenntnis der Fusuliniden: *Neues Jahrb. Min., Geol. und Pal., Beilage* **27**, p. 461—508, pls. 7, 8, text figs. 1—16.
- [23] ———, 1912. Monographie der Fusulinen. Teil III: Die Fusulinen (Schellwienien) Nordamerikas: *Palaeontographica*, **59**, 157—191, pls. 15—20.
- [24] Thompson, M. L., 1935. The Fusulinid Genus Yangchienia Lee: *Ecologiae geol. Helvetiae*, **28**, 511—517, pl. 17.
- [25] ———, 1936. The fusulinid Genus Verbeekina: *Jour. Palaeontology*, **10**, 193—201, pl. 24.
- [26] ———, 1937. Fusulinids of the Subfamily Schubertellinae: *Jour. Palaeontology*, **11**, 118—125, pl. 22.
- [27] ———, 1946. Permian Fusulinids from Afghanistan: *Jour. Palaeontology*, **20**, 140—157, pls. 23—26.
- [28] Thompson, M. L., & Foster, C. L., 1937. Middle Permian Fusulinids from Szechwan, China: *Jour. Palaeontology*, **11**, 126—144, pls. 23—25.
- [29] M. L., & Wheeler, H. E., 1942. Thompson, Permian Fusulinids from British Columbia, Washington and Oregon: *Jour. Palaeontology* **16**, 700—711, pls. 105—109.
- [30] Douglas, J. A., 1950. The Carboniferous and Permian Faunas of South Iran and Iranian Baluchistan: *Palaeontologia Indica* new ser., vol. 22, Mem. No. 7, pp. 35—54, pl. 5.
- [31] Skinner, J. W. and Wilde, G. L., 1954. The Fusulinid Subfamily Boultoninae: *Jour. of Palaeontology*, **28**, (4), 434—444, pls. 42—45.
- [32] Skinner, J. W. and Wilde, G. L., 1954. Fusulinid Wall Structure: *Jour. of Palaeontology*, **28**, (4) 445—451, pls. 42—45.

# PALAEONTOLOGIA SINICA

*Whole Number 140*

*New Series B. No. 6*

BOARD OF EDITORS

J. S. Lee, C. C. Young, H. C. Sze, Y. C. Sun,  
T. H. Yin, C. C. Yu, S. Chen

## FUSULINIDAE OF SOUTH CHINA, PART II

By

S. Chen

*The Department of Geology, Nanking University, Nanking*

With XIV Plates

Edited by *Institute of Palaeontology* Academia Sinica  
*Laboratory of Vertebrate Palaeontology*

Published by Science Press.

(Issued June 1956)



## CONTENTS

	<i>Page</i>
Preface .....	17
Description of species .....	18
Class Rhizopoda .....	18
Order Foraminifera d'Orbigny .....	18
Family Fusulinidae Möller .....	18
Subfamily Ozawainellinae Thompson & Foster .....	18
Genus <i>Ozawainella</i> Thompson .....	18
<i>Ozawainella hunanensis</i> Chen (sp. nov.) .....	18
Genus <i>Nankinella</i> Lee .....	19
<i>Nankinella inflata</i> (Colani) .....	19
Subfamily Schubertellinae Skinner .....	19
Genus <i>Yangchienia</i> Lee .....	20
<i>Yangchienia kwangsiensis</i> Chen (sp. nov.) .....	20
Subfamily Boultoninae Skinner & Wilde .....	20
Genus <i>Gallowainella</i> Chen .....	21
<i>Gallowainella minima</i> Chen (sp. nov.) .....	21
Subfamily Schwagerininae Dunbar & Henbest .....	21
Genus <i>Schwagerina</i> Möller .....	22
<i>Schwagerina subobsoletus</i> var. <i>okuboensis</i> Ozawa .....	22
<i>Schwagerina tieni</i> Chen (sp. nov.) .....	23
<i>Schwagerina kwangchiensis</i> Chen (sp. nov.) .....	23
<i>Schwagerina henbesti</i> Chen (sp. nov.) .....	24
<i>Schwagerina wuhsüehensis</i> Chen (sp. nov.) .....	25
<i>Schwagerina paralpina</i> Chen (sp. nov.) .....	26
<i>Schwagerina megalocula</i> Chen (sp. nov.) .....	27
<i>Schwagerina longipertica</i> Chen (sp. nov.) .....	27
<i>Schwagerina yüi</i> Chen (sp. nov.) .....	28
<i>Schwagerina skinneri</i> Chen (sp. nov.) .....	29
<i>Schwagerina tienchiaensis</i> Chen (sp. nov.) .....	30
<i>Schwagerina exilis</i> Schwager .....	30
<i>Schwagerina lingyunensis</i> Chen (sp. nov.) .....	31
<i>Schwagerina mengi</i> Chen (sp. nov.) .....	31
<i>Schwagerina brevipolu</i> Chen (sp. nov.) .....	32
<i>Schwagerina multialveola</i> Chen (sp. nov.) .....	33
<i>Schwagerina suni</i> Chen (sp. nov.) .....	34
<i>Schwagerina chinensis</i> Chen (sp. nov.) .....	35
<i>Schwagerina hunania</i> Chen (sp. nov.) .....	35
<i>Schwagerina yunnanensis</i> Chen (sp. nov.) .....	36
<i>Schwagerina longitermina</i> Chen (sp. nov.) .....	37

	<i>Schwagerina hupehensis</i> Chen (sp. nov.) .....	38
	<i>Schwagerina pactiruga</i> Chen (sp. nov.) .....	39
	<i>Schwagerina granum-avenae</i> Roemer .....	40
Genus	<i>Chusenella</i> Hsu .....	41
	<i>Chusenella tingi</i> Chen (sp. nov.) .....	41
	<i>Chusenella deprati</i> Ozawa .....	42
	<i>Chusenella conicocylindrica</i> Chen (sp. nov.) .....	43
	<i>Chusenella douvillei</i> (Colani) .....	44
Genus	<i>Paraschwagerina</i> Dunbar & Skinner .....	45
	<i>Paraschwagerina shengi</i> Chen (sp. nov.) .....	46
Subfamily	Verbeekinae Staff & Wedekind .....	46
Genus	<i>Verbeekina</i> Staff .....	47
	<i>Verbeekina verbeeki</i> Geinitz .....	47
	<i>Verbeekina verbeeki sphaera</i> Ozawa .....	48
	<i>Verbeekina ellipsoidalis</i> Chen (sp. nov.) .....	49
	<i>Verbeekina crassispira</i> Chen (sp. nov.) .....	49
Genus	<i>Misellina</i> Schenck & Thompson .....	50
	<i>Misellina lepida</i> (Schwager) .....	50
	<i>Misellina major</i> Deprat .....	51
	<i>Misellina compacta</i> Chen (sp. nov.) .....	52
Genus	<i>Pseudodoliolina</i> Yabe & Hanzawa .....	52
	<i>Pseudodoliolina ozawai</i> Yabe & Hanzawa .....	53
Subfamily	Neoschwagerinae Dunbar & Condra .....	54
Genus	<i>Cancellina</i> Hayden .....	54
	<i>Cancellina schellwieni</i> Deprat .....	54
Genus	<i>Neoschwagerina</i> Yabe .....	55
	<i>Neoschwagerina simplex</i> Ozawa .....	55
	<i>Neoschwagerina craticulifera</i> Schwager .....	56
	<i>Neoschwagerina douvillei</i> Ozawa .....	58
	<i>Neoschwagerina colaniae</i> Ozawa .....	59
	<i>Neoschwagerina multicircumvoluta</i> Deprat .....	60
	<i>Neoschwagerina leei</i> Chen (sp. nov.) .....	61
	<i>Neoschwagerina margaritae</i> Deprat .....	62
	<i>Neoschwagerina megaspherica</i> Deprat .....	63
Genus	<i>Yabeina</i> Deprat .....	64
	<i>Yabeina shiraiwensis</i> Ozawa .....	64
	<i>Yabeina inouyei</i> Deprat .....	65
	<i>Yabeina proboscis</i> Chen (sp. nov.) .....	66
	<i>Yabeina</i> sp. ....	66
Genus	<i>Afghanella</i> Thompson .....	67
	<i>Afghanella schencki</i> Thompson .....	67
	<i>Afghanella sumatrinaeformis</i> Gubler .....	68
Genus	<i>Sumatrina</i> Volz .....	69
	<i>Sumatrina annae</i> Volz .....	69
	<i>Sumatrina longissima</i> Deprat .....	70

# THE FUSULINIDAE OF SOUTH CHINA, PART II

CHEN SHU

*Department of Geology, Nanking University*

## PREFACE

The present part treats of the Fusulinidae of the Maok'ou limestone in the southwestern provinces of China and its equivalents, such as the Chingsichung limestone of Hunan and the Wuhsueh limestone in Hupeh. These limestones are in thick beds and whitish-gray colour, occasionally with siliceous nodules rarely scattered in the lower beds. In Kwangsi Province the Maok'ou limestone is reported to be well developed up to a thickness of several hundred metres. According to Dr. T. K. Huang, this limestone in Kweichow Province is about one hundred metres thick. The Chingsichung limestone in Hunan and the Wusueh limestone in Hupeh likewise all reach around one hundred metres in thickness.

In southeastern Hupeh the Wuhsueh limestone overlies about sixty metres of silicified shales probably equivalent to the Kufeng formation and underlies the Tanshanwon coal series, which, in turn underlies the thin-bedded Tayeh limestone of the Triassic age.

The Permian rock sequence in Hunan is nearly the same as in Hupeh only except for the underlying siliceous beds which seem to be not so well developed in that province.

The relation of the Maok'ou limestone with the rocks lying above and below in the southwestern provinces is at present not yet quite clearly known.

The fusulina fauna of the Maok'ou limestone and its equivalents is composed largely of the highly advanced forms such as *Schwagerina*, *Chusenella*, *Misellina*, *Pseudodoliolina*, *Neoschwagerina*, *Yabeina*, *Afghanella*, and *Sumatrina*. The other genera are represented only by few species. In this paper 58 species are described, of which 32 are new species.

The exact vertical distribution of the leading forms is yet uncertain, but the general distributional condition in vertical range may be stated as follows:

*Pseudodoliolina ozawai* Yabe et Hanzawa, *Cancellina schellwieni* Deprat, *Neoschwagerina craticulifera* Schwager, *Misellina lepida* Schwager and *Verbeeckina verbeecki* Geinitz usually occur in the lower part of the Maok'ou limestone. *Chusenella douvillei* (Colani), *Neoschwagerina margaritae* Deprat, *Yabeina inouyei* Deprat, *Afghanella schencki* Thompson, *Afghanella sumatrinaeformis* Gubler, *Sumatrina annae* Volz and *Sumatrina longissima* Deprat are found in the upper part.

The material described in this paper was collected mostly from the Chingsichung limestone in Hunan with a moderate part from the Wuhsueh limestone in Hupeh. An additional supply from Kwangsi Province was submitted to me by Messrs. C. Li and W. Y. Cheng. A small part of the material was also obtained from the Province of Yunnan.

I am greatly indebted to Dr. J. S. Lee for his kind direction and encouragement. Much obliged also I feel to Messrs. C. C. Tien, H. C. Wang, T. Y. Liu, H. M. Meng, C. Li and W. Y. Chang for their kind supply of the useful material. To miss Y. Ho, who earnestly helped me in the preparation of plates of figures, I herewith express my hearty thanks.

## DESCRIPTION OF SPECIES

## CLASS RHIZOPODA

## Order Foraminifera d'Orbigny

## Subfamily Ozawainellinae Thompson &amp; Foster, 1937

This subfamily contains the minute forms; the test is lenticular to subspheroidal, involute or evolute; the periphery is angular or rounded; the axis of the test is shorter than the other diameters; the spirotheca is generally composed of tectum and inner and outer tectoria, or consists of tectum, diaphanotheca and tectoria, or only of tectum and diaphanotheca in the advanced forms; the septa are usually unfluted; the aperture is singular; the chomata are well developed throughout the shell, the proloculum is small.

Ozawainellinae are known from the late Carboniferous to the Permian.

Genus *Ozawainella* Thompson, 1935Genotype *Ozawainella angulata* (Colani) = *Fusulinella angulata* Colani, 1924

Test is small and lenticular, with the axis shorter than the other diameter. Periphery is subacutely angular. The proloculum is small. The whorls are bilaterally symmetrical. Chomata are strong with a steep slope toward the tunnel and a gentle slope on the outer side. The tunnel is reniform. The spirotheca is thin, consisting of a thin tectum, a thin diaphanotheca and thicker tectoria. Septa are plane.

Range: Middle Carboniferous to Permian.

*Ozawainella hunanensis* Chen sp. nov.

(Pl. I, figs. 1—3)

Test small, lenticular with the umbilical region roundly inflated and the periphery moderately angular. The axial length is 1.46—1.65 mm and the median width 2.75—2.87 mm. The ratio of the length to the width is 1:1.9. Whorls are numerous, 9 in number, and are highly vaulted so that the median zone forms an acute angle of about 45°.

The width of the whorls is found as follows (in mm):

I	0.38	VI	1.68
II	0.56	VII	2.08
III	0.77	VIII	2.39
IV	1.00	IX	2.75
V	1.33		

Spirotheca thin, measuring 0.023 mm thick in the outer whorls, consisting of three layers: the tectum, the diaphanotheca and the inner tectorium. The outer tectorium seems to be not well developed.

Septa thin, almost plane; their number in the whorls is unknown.

Buccal aperture yoke-shaped, low and narrow, being 0.11 mm broad in the fifth volution and 0.17 mm in the eighth.

Chomata are represented in two small ridges on the slopes near the edge.

Proloculum circular in axial section, with a diameter of 0.13 mm.

Horizon and locality: In the lower part of the Chinghsichung Limestone, Hut'ien, Hsianghsiang County, Hunan Province. The associated forms are *Sumatrana annae* Volz and *Neoschwagerina craticulifera* Schwager. It is also found in the Maok'ou Limestone at Chienkiang, Kwangsi Province.



### Genus *Nankinella* Lee, 1933

#### Genotype *Nankinella orbicularia* Lee, 1931

Test medium-sized, lenticular, with sharply rounded periphery and convex umbilicus. Whorls numerous. Wall composed of tectum, thin diaphanotheca and an inner tectorium; septa almost plane; proloculum small; Chomata strong; aperture slit-like.

Range: Permian of Asia, Europe and America.

#### *Nankinella inflata* (Colani)

(Pl. I, figs. 4—7)

1924. *Fusulinella inflata*, Colani: *Mém. Serv. Géol. l'Indochine*, Vol. XI, Fasc. I, pp. 77, 78; Pl. XV, figs. 3—5, 7—10, 13, 15.

Test discoidal with an axial length shorter than the median width. The former is 2.36 mm and the latter 3.04 mm measured from a specimen of eight whorls; the proportion of the length to the width is 1:1.3. The periphery of the test is round. Whorls are close, 8 or 9 in number, distending thus tardily that the increase in whorl-height is scarcely perceptible in the last whorls.

Two measurements of whorl-width are tabulated below:

	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.56	0.97	1.33	1.68	2.07	2.42	2.75	3.04	5625
	0.53	0.72	1.06	1.45	1.83	2.19	2.51	2.90	5629

Spirotheca is thin; but slowly thickens while coiling forward, about 0.05 mm thick in the last whorl. In a bad state of preservation, the composition of the spirotheca cannot be clearly observed, but it appears to consist of three layers: the tectum, the diaphanotheca and the inner tectorium; the diaphanotheca is several times thicker than either of the other two.

Septa thick and short, almost plane. They count 26 in the last volution.

Buccal aperture very narrow, crescentic.

Chomata appear in the form of monoclinial ridges on the slopes near the vaulted periphery.

Proloculum nearly spherical, fairly large, 0.23—0.29 mm in diameter.

Horizon and locality: It occurs alone in certain beds in the Maok'ou Limestone, Chungshan, Kwangsi Province.

#### Subfamily Schubertellinae Skinner, 1931

This subfamily contains small fusulinids; their tests are small and fusiform, the juvenile volution is coiled askew to the outer whorls; the spirotheca of the primitive forms is composed of tectum and inner and outer tectoria, but in the advanced forms it is composed of tectum diaphanotheca and inner and outer tectoria, the spirotheca of some forms is composed of a thin dense layer; the septa of the primitive forms are straight throughout the length of the test, while those of the advanced forms are fluted in the polar regions but straight in the central part of the test; the aperture is singular; chomata are well developed; the proloculum is minute.

This subfamily occurs from the Middle Carboniferous to the Permian.

### Genus *Yangchienia* Lee, 1933

#### Genotype *Yangchienia iniqua* Lee, 1933

Test very small, fusiform; the inner whorls endothyroid with an axis of coiling nearly at right angles to the next whorls. Spirotheca very thin, composed of tectum and diaphanotheca without tectoria; septa plane, chomata extraordinarily strong and wide, sloping away from the tunnel toward the poles.

Range: Permian of Asia and Europe.

#### *Yangchienia kwangsiensis* Chen sp. nov.

(Pl. I, figs. 8—11)

Test small, fusiform, considerably vaulted in the median zone, pointed at the poles. It measures 1.43 mm long and 0.89 mm broad; the proportion of the width to the length is 1:1.6. All the whorls are compact; the first two globular, the rest fusiform and roughly following the contour of the test. The number of whorls is not less than 7

The width of the whorls measured from two slightly eccentrically axial sections is tabulated below.

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.15	0.22	0.31	0.41	0.54	0.71	0.89	5305
	0.15	0.22	0.32	0.41	0.54	0.66	0.70	5311

Spirotheca particularly thin, composed of only two layers; the tectum and the diaphanotheca; the tectoria are absent. It measures only 0.027 mm thick in the outermost whorl.

Antethecae almost unfluted; the antethecal number is not known.

Buccal aperture narrow being 1/10 the length of the whorl.

Chomata strongly built into two broad and high ridges which rise up to more than two thirds the height of the chamber. The outer side of the chomata distantly extended laterally into the vicinity of the poles in some cases.

Axial fillings entirely absent.

Proloculum has not been excellently prepared out, but is roughly estimated at 0.05 mm in diameter. The general shape is spherical or spheroidal.

Remarks: This form is characterized by the fusiform test, the thin spirotheca and the large chomata. It is rather similar to the Chihsia form *Yangchienia iniqua* Lee in the internal structure but differs from the latter chiefly in the fusiform contour of the test.

Horizon and locality: This species occurs rather in abundance in the Maok'ou Limestone in the hills 10 kilometres east of Liangyun, Kwangsi Province. The associated forms are *Schwagerina exilis* Schwager and *Cancellina schellwieni* Deprat.

### Subfamily Boultoninae Skinner & Wilde, 1954

This subfamily consists of the small forms; their tests are fusiform to subglobular. The proloculum is small or even minute. The juvenarium is generally coiled askew to the outer whorls and is lenticular or discoidal in shape. The spirotheca is composed of a tectum and a diaphanotheca. The septa are strongly fluted. The aperture is singular. The chomata are developed throughout the test.

At present time all the described forms are from the Permian rocks.

### Genus *Gallowainella* Chen, 1937

#### Genotype *Gallowainella meitienensis* Chen, 1934

The test of *Gallowainella* is small and subcylindrical: the spirotheca is composed of thin tectum and thin diaphanotheca; the septa are thin and intensely fluted for the whole surface to form high and regular folds. The chomata are absent. The buccal aperture is very narrow and the tunnel widens very slowly. The axial fillings are usually developed in the inner whorls. The proloculum is small and spherical.

Remarks: The first form of the present genus was described by me in 1934 under the name *Gallowaina meitienensis* from the Meitien Limestone in Southern Hunan. The specimens were collected by Mr. Y. Y. Lee. The horizon of the limestone is somewhat doubtful. According to Mr. Lee the Meitien Limestone is above the Permian coal series and may be equivalent to the Doaling Coal Series in Hunan Province. Therefore the limestone containing the discussed form may be equivalent to the Changing limestone which is widely distributed in South China.

The generic name *Gallowainella* was proposed by me to replace *Gallowaina* in 1937, for the latter name differs from Ellis' *Gallowayina* only in a letter and therefore is a homonym of it.

Range: Upper Permian.

#### *Gallowainella minima* Chen sp. nov.

(Pl. I, figs. 22—24)

It is a rare species in the Chingsichung Limestone of Hunan Province. Only two para-axial and some oblique sections have been prepared. A para-axial section very close to the proloculum is 2.60 mm long and 0.54 mm broad and has five whorls revealed including the first one which has an axis of convolution at a great angle to that of the outer four volutions. The first whorl consists of narrow chambers with extremely thin septa which smoothly bend anteriorly and downward. The second whorl, or the first one of the second stage, is globular and the rest quickly extend laterally to take an irregularly cylindrical form with the median zone slightly vaulted. The polar parts of the last volution are prodigiously prolonged, the median zone flattens and the depressions disappear. All the whorls are closely coiled. The spirotheca is exceedingly thin, composed of tectum and translucent diaphanotheca of which, also owing to ill-preservation, the inner boundary is difficult to be clearly delimited. Septa are probably unfluted in the first whorl and this may hold true for the second volution; those in the other ones are regularly folded from pole to pole, having only a small unaffected portion in the upper margin. The shape of the buccal aperture is unknown. The Chomata are not developed. The axial fillings are poorly built as two small masses in the lateral regions of the third volution. The shape and size of the proloculum are at present not yet known.

Remarks: In the structure of the spirotheca and the folding of the antethecae, this species much resembles *Gallowainella meitienensis* Chen, but the endothyal chambers in the first whorl and the more extended polar parts of the last whorls are the points available for distinguishing it from the latter species. In addition, the adult form of *Gallowainella meitienensis* Chen generally possesses six or seven whorls, while the present form has only five volutions. Whether the present specimens are the young forms or not cannot be decided. But in want of larger forms with more whorls the specimens obtained perhaps have reached the mature stage. As the material is so meager, the determination is still more or less tentative.

Horizon and locality: This species occurs in the Chingsichung Limestone, Hsianghsiang County, Hunan Province, and in the Wuhsueh Limestone, Kwangchi County, Hupeh Province.

#### Subfamily Schwagerininae Dunbar & Henbest, 1930

This subfamily is composed of small or large fusulinids, the test is fusiform, subcylindrical or globular; the pro-

loculum is small or large; the spirotheca is composed of tectum and keriotheca; the septa are weakly or strongly fluted; the aperture is singular; the chomata are well developed, rudimentary or lacking.

Range: From the Upper Carboniferous to the Permian.

### Genus *Schwagerina* Möller, 1877

Genotype, *Schwagerina princeps* (Ehrenberg) = *Borelis princeps* Ehrenberg, 1842

Test fusiform to subcylindrical; wall composed of tectum and keriotheca. Tunnel siite-like, median; chomata are wanting or rudimentary and confined to the inner whorls. Septa strongly fluted and the opposite folds of the adjacent septa meet near the base, subdividing the meridional chambers into cell-like chamberlets.

The species formerly described under *Pseudofusulina* of Dunbar and Skinner are now referred to the old name *Schwagerina*, and *Pseudofusulina* is a synonym. *Pseudoschwagerina* and *Paraschwagerina* were proposed by Dunbar and Skinner to embrace the forms which had been put under *Schwagerina* of the old conception of the genus.

Range: Upper Carboniferous and Permian.

### *Schwagerina subobsoletus* var. *okuboensis* Ozawa

(Pl. I, fig. 12)

1927. *Schellwienia subobsoleta* var. *okuboensis*, Ozawa: *Jour. Fac. Scien. Tokyo*, pp. 149, 150; Pl. XXXVII, figs. 8a, 9a.

Test small, subcylindrical, more or less vaulted in the median zone, rounded at the extremities. The axial length measures 3.61 mm, the median width about 1.33 mm. Whorls are close, following the contour of the test. The number of whorls is 6-7.

A result of measurement is as follows:

	Whorls						Specimen
	I	II	III	IV	V	VI	
Width (in mm)	0.19	0.27	0.35	0.46	0.60	0.78	5379
Thickness of spirotheca (in mm)	0.020	0.022	0.022	0.027	0.027	0.028	

Spirotheca thin and slowly thickening outward; alveoli in the keriotheca fairly coarse.

Antethecae not far thinner than the spirotheca, little fluted for the large median area and simply folded in the polar regions. The antethecal number is not known because of lack of the median section.

Buccal aperture is unknown both in shape and size.

Chomata seem to grow to the last whorls, though weak in strength.

Axial fillings in irregularly round masses are in the inner portions of the lateral regions and connected with the proloculum by means of a small neck.

Proloculum spheroidal, small, 0.10 mm in diameter.

Remarks: The present form is quite comparable with Ozawa's original specimen in the small size, general shape, compact whorls, thin spirotheca, simply fluted antethecae, small proloculum and other features. Therefore the identification is apparently out of question though the material whereupon the determination depends is very scarce.

Horizon and locality: It is a rare species occurring together with *Neoschwagerina leei* Chen in the Chinghsichung Limestone, Hungshantien, Hsianghsiang County, Hunan Province.

***Schwagerina tieni* Chen sp. nov.**

(Pl. I, figs. 13—16)

Test small, elongately fusiform, gently vaulted in the median zone and slightly rounded at the poles. The axial length and the median width of a specimen with six whorls measure respectively 2.79 mm and 0.69 mm. In a slightly para-axial section, the length attains to 4.49 mm and the width 1.08 mm. The axial ratio is nearly 1:4 in these two cases. Whorls are all fusiform and close, and more so for the first four or five volutions. The height of the whorl almost remains constant along the axial direction. The number of whorls is usually seven in mature forms.

A result of measurement is given below:

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.13	0.20	0.27	0.35	0.49	0.69	0.97	5058
	0.15	0.20	0.30	0.39	0.53	0.69		5059

Spirotheca thin, slowly and regularly thickening forward, and maintaining the same thickness toward the poles. It measures only 0.048 mm thick in the last whorl where the thickest part exists. Alveoli in the keriotheca are rather fine.

Antethecae not much thinner than the spirotheca, simply fluted into round folds in the lower half or more of the antethecal surface. The polar parts are twisted only to produce simple reticulations. In one case, they are almost unfluted in the large median area in four inner volutions.

Buccal aperture rather high but very narrow, over one half as high as the chamber and 1/22 as broad as the length of the volution. The angle of the tunnel is 21°.

Chomata well developed, running up to the sixth volution, and disappearing rather suddenly in the last whorl.

Proloculum spherical, minute, thick-walled, with a diameter not exceeding 0.09 mm.

Axial fillings developed as two long bars beginning at the very lateral side of the proloculum, and extending and meanwhile enlarging toward the poles until within a short distance from the extremities of the test.

This species is characterized by the small test, the simple antethecal folding and the well-developed chomata and axial fillings. The name is proposed after Mr. C. T. Tien.

Horizon and locality: This species is found in the lower part of the Chingsichung Limestone, Hutien, Hsiang-hsiang County, Hunan Province.

***Schwagerina kwangchiensis* Chen sp. nov.**

(Pl. I, figs. 17, 18)

Test elongately subcylindrical, slightly curved, very slightly vaulted in the median zone and rounded at the poles. The axial length is 6.15 mm, the median width 1.54 mm; the axial ratio is 1:4. Whorls close, the first three or four appearing a little more compact. The height of the whorl does not vary much along the direction of the axis. The number of whorls is 6 or 7.

The following figures represent the rate of evolution of the whorls and the strength of the spirotheca.

	Whorls						Specimen
	I	II	III	IV	V	VI	
Width (in mm)	0.38	0.52	0.68	0.91	1.24	1.54	4671
Thickness of spirotheca (in mm)	0.013	0.013	0.027	0.034	0.041	0.041	

Spirotheca thin, gradually thickening forward in the spiral direction and maintaining the almost constant thickness in the axial direction. Alveoli in the keriotheca moderately fine.

Antethecae fairly thick, rather regularly and intensely folded into close folds almost for the whole surface. The polar parts of the antethecae are twisted to produce simple anastomoses. The antethecal number is yet unknown.

Buccal aperture ill-defined, low and narrow.

Chomata are doubtfully represented by weak ridges in a few inner whorls, but completely wanting in the outer volutions.

Axial fillings are rather well developed as two long narrow bars in the lateral regions next to the proloculum, the inner end connecting with the wall of the proloculum, the outer end stopping short from the pole of the test at a fair distance.

Proloculum nearly circular in the axial section with a diameter of 0.28 mm; the entire form is probably spheroidal. The wall of the proloculum is peculiarly constructed with three layers, the inner and outer layers composed of a dark, structureless calcareous matter and interposed by a third lighter and narrower layer in one case. In another specimen this structure is not present.

Remarks: This form presents difference from *Schwagerina exilis* (Schwager) in the elongately subcylindrical test, the more compact whorls and the smaller proloculum. It differs from *Schwagerina chihsiaensis* (Lee) in developing a subcylindrical test and a much larger proloculum. The antethecae are more intensely and lightly fluted in the present species, but those in *Schwagerina chihsiaensis* (Lee) are influenced only in the lower half or more by the action of folding. In addition, the first two or three whorls in the former form, though somewhat more compact, may be said as still coiling almost according to the same rate of evolution; in the latter species the early whorls are plainly coiled at a different rate from that in the next volutions.

Horizon and locality: This form occurs in association with *Chusenella deprati* Ozawa, and *Schwagerina yüi* Chen in the lower beds of the Wuhsueh Limestone in the hills 10 kilometres west of Wuhsueh, Kwangchi County, south-eastern Hupeh.

### *Schwagerina henbesti* Chen sp. nov.

(Pl. I, figs. 19—21)

Test subcylindrical, slightly incurved in some cases. The axial length and the median width measure 8.28 mm and 2.42 mm respectively; the form ratio is 1:3.4. The whorls are developed in two distinct stages; the first stage is made up of four fusiform and particularly close volutions, and the second stage of four subcylindrical and loose whorls. The total number of whorls is 8.

The width of the whorls and the thickness of the spirotheca are given in the following table.

	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.19	0.26	0.35	0.47	0.77	1.06	1.84	2.41	4635
Thickness of spirotheca (in mm)	0.01	0.013	0.020	0.020	0.027	0.068	0.089	0.096	

Spirotheca particularly thin in the four inner whorls in which it measures only 0.014 mm thick in the fourth volution. The spirotheca of the outer volutions thickens rather rapidly as it coils forward, attaining to 0.10 mm in the last part of the eighth or rather the early portion of the ninth volution. The alveolar structure of the keriotheca is moderately fine.

Antethecae almost plane in the early developmental stage as mentioned above, while they are intensely and more or less irregularly fluted almost to the upper margin in the later stage of development. As to the thickness of the antethecae, those in the inner whorls are nearly as thick as the spiral wall, but they are much thinner in the outer ones. The antethecal number is unknown.

Buccal aperture slit-like, low and narrow.

Chomata weak but distinct, only observed in the inner fusiform whorls.

Proloculum circular in the axial section, small with a diameter of only 0.08 mm.

Axial fillings are built as two irregular narrow bars in the lateral regions of the axial zone without intruding into the inner compact whorls.

This species is named in honour of L. G. Henbest.

Horizon and locality: The specimens of this species are obtained from the Wuhsueh Limestone, Kwangchi County, Hupeh Province in association with *Chusenella douvillei* (Colani) and *Neoschwagerina craticulifera* Schwager.

### ***Schwagerina wuhsuehensis* Chen sp. nov.**

(Pl. II, figs. 4—6)

Test small, regularly fusiform in typical forms; in some cases the lateral parts close to the poles are slightly contracted and consequently the poles tend to be somewhat produced with blunt ends. The axial length and the median width are 6.50 mm and 1.43 mm respectively; the axial ratio is 1:2.5. The first four whorls are extraordinarily close, but the others are comparatively loose. As a whole all the whorls are tightly and regularly coiled so that the height of the chamber shows little variation in the axial direction. A long and narrow axial filling is well developed in either lateral region between the pole and the proloculum, and this feature seems to be very persistent in this species. The number of whorls is 7 to 7½.

The width of the successive whorls is shown by the following figures (in mm):

I	0.13
II	0.19
III	0.26
IV	0.37
V	0.53
VI	0.82
VII	1.18

Spirotheca exceedingly thin in the first volution and gradually becoming thick in the other whorls. The maximum thickness is but 0.05 mm in the sixth whorl. The alveoli of the keriotheca are moderately fine.

Antethecae are little fluted in the first four compact whorls. The lower half of those in the next volutions is folded into angular folds. In the last one or two whorls, broad and round loops are formed along the whole antethecal surface. The antethecal number is 19, 23, 24, and 29 respectively in the last four volutions.

Chomata poorly built as two small ridges only in the inner whorls, probably absent in the outer ones.

Buccal aperture low and narrow, measuring 0.20 mm long and 0.04 mm high in the anterior part of the seventh volution.

Proloculum spherical, minute, having a diameter of 0.08 mm.

Horizon and locality: This species occurs in moderate abundance in the lower beds of the Wuhsueh Limestone, Kwangchi County, Hupeh Province, with *Chusenella douvillei* Colani and *Neoschwagerina craticulifera* Schwager as its associates.

***Schwagerina paralpina* Chen sp. nov.**

(Pl. II, figs. 9—11)

Test subcylindrical, more or less slender, with the extremities roundly terminated. The axial length is 7.22 mm and the median width 2.42 mm in a specimen with  $6\frac{1}{2}$  whorls. The axial ratio derived from the above two figures is nearly 1:3. The first three whorls are fusiform and tight while the rest subcylindrical and rather evolute. The number of whorls is  $6\frac{1}{2}$ .

The results of measurements are as follows:

	Whorls						Specimen
	I	II	III	IV	V	VI	
Width (in mm)	0.32	0.50	0.74	1.09	1.62	2.19	4786
	0.41	0.65	0.88	1.36	1.92	2.39	4787
Thickness of spirotheca (in mm)	0.027	0.027	0.041	0.045	0.068	0.075	4786

Spirotheca thin, slowly thickening toward the outer whorls, and slightly waving axially and at the same time varying in thickness to some extent. The tectum is exceedingly thin and is hardly preserved in a great number of places in the spirotheca; the alveolar structure of the keriotheca is fine. There are two sorts of fibres in the keriotheca. The short or secondary fibres first appear, one intercalating between the long or primary ones in the fourth or fifth volution.

Antethecae are much thinner than the spirotheca and more or less irregularly folded into broad folds in the lower part of the antethecal surface in the early volutions, but the folds become higher, occasionally reaching the upper margin in the next whorls. The umbilical parts of the inner antethecae are twisted into only coarse reticulations, but those in the outer ones form complicated and fine anastomoses.

In a somewhat doubtful median section the antethecae are rather widely spaced and their number in the first five successive volutions is found to be 11, 12, 14, 17 and 18 respectively.

Chomata not well developed, appearing only as two small doubtful spots on the outer surface of the proloculum and perhaps running into the second volution.

The shape of the buccal aperture has not been definitely observed; its breadth is about  $1/10$  the length of the respective chamber in the fifth volution.

Axial fillings are entirely wanting.

The initial chamber circular in axial section, measuring 0.19 mm in diameter. This value is really a little smaller than the actual size for the section does not pass through the centre or so. In a median section which is mostly assignable to the same species there is an ovoid proloculum, of which the short diameter is 0.26 mm and the long one 0.38 mm.

Remarks: This is a rare species. In the present large collection of ours only an axial section and a median one have been cut, but the characteristic features are excellently revealed. The large median portion of all the septa is rather irregularly fluted according to the type of *Schwagerina alpina* var. *vetusta* of Schellwien; however the present form is still quite distinct from the latter in having more whorls, thinner spirotheca and much more complicated polar networks. There is a still more difference in the development of the chomata between the two forms. In Schellwien's form the chomata appear rather strongly developed as observed in the illustrations, while they can scarcely be recognized distinctly in our form. *Schwagerina alpina* var. *antiqua* of Schellwien is more readily distinguished from the present species in having a more fusiform test, less coils, simpler polar anastomoses and more irregular and intense



folding of the septa.

The Uralian form of *Schwagerina alpina* Schellwien in our country is widely different from the present form in developing less and looser whorls, in having more irregular antethecal folding and in forming simple coarse polar reticulations.

Horizon and locality: This new species is found in the basal part of the Chinghsichung Limestone, 2.5 kilometres south of Hutien Town, Hsianghsiang County, Hunan Province. *Schwagerina multialveola*, *Schwagerina hunania*, *Schwagerina megalocula*, *Schwagerina tingi* and *Chusenella douvillei* are its associates.

***Schwagerina megalocula* Chen sp. nov.**

(Pl. II, fig. 12)

Test subcylindrical, slightly vaulted in the median zone and rounded at the poles. The axial length is 5.59 mm and the median width 1.88 mm measured from a test which has only four whorls. The axial ratio is nearly 1:3. Whorls few, four in number, moderately evolute, the inner two volutions more fusiform and the outer ones subcylindrical.

Some measurements are as follows:

	Whorls				Specimen
	I	II	III	IV	
Width (in mm)	0.71	1.05	1.43	1.88	4804
Thickness of spirotheca (in mm)	0.029	0.029	0.064	0.085	

Spirotheca thin in the first two whorls and rapidly thickening in the other two. The tectum appears exceptionally thick in the last spiral wall, but it is rather thin in the inner whorls. The keriotheca has a fine alveolar structure.

Antethecae much thinner in comparison with the spirotheca, little fluted in the apertural area and slightly folded in the lateral zones where only a few low and broad folds are formed in the lower part of the antethecae. In the polar zone, the antethecae are twisted into simple and large-sized reticulations. Antethecal number in the successive volutions is not yet known.

Buccal aperture narrow but rather high in the outer whorls.

Chomata absent. Axial fillings are not developed.

Proloculum large, not regular in shape almost rectangular in the axial section, ranging from 0.32 mm to 0.56 mm in diameter. The prolocular wall is fairly thick.

This species is a rare one in our collection. Its peculiarities lie in the fewness of whorls, the rapid change in thickness of the spirotheca, and especially in the large size of the proloculum. There is no already described species comparable with our form. Though in such scarceness of material as only one axial section of the test has been procured it rather deserves a specific rank.

Horizon and locality: This species associates with *Schwagerina multialveola* Chen and *Schwagerina hsianghsiangensis* Chen in the lowest beds of the Chinghsichung Limestone in the southern neighbourhood of Hutien, Hsianghsiang County, Hunan Province.

***Schwagerina longipertica* Chen sp. nov.**

(Pl. II, figs. 7, 8)

Test small, more cylindrical than fusiform with the median zone slightly vaulted and the ends rounded. The axial length is 5.47 mm and the median width 1.42 mm in a specimen with seven whorls; the axial ratio is 1:3.7. All the whorls are close and the first two or three are more so. The inner six volutions are all elongately fusiform and

with pointed terminations; the last whorl begins to take a subcylindrical shape. The height of the whorl in the polar region is not very much greater than that in the median part on account of the lateral extension of the extremities of all the volutions. The number of whorls is 7.

The rate of evolution of the whorls and the thickness of the spirotheca are represented by the following figures:

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.20	0.26	0.37	0.55	0.77	1.06	1.42	5166
Thickness of spirotheca (in mm)	0.013	0.013	0.020	0.022	0.041	0.054	0.054	

Spirotheca exceedingly thin in the first three or four whorls, thence increasing very slowly in thickness in the other volutions. The alveolar structure of the keriotheca is rather coarse.

Antethecae appear not much thinner than the spirotheca and specially regularly and intensely fluted almost for the whole surface. In the outer four whorls parallel and compressed folds are regularly disposed even in the near vicinity of the poles. This phenomenon has not ever happened in other known species. The antethecal anastomoses in the polar regions are not very complex nor well developed. The antethecae number 18, 25, 26 in the fourth, fifth and sixth volutions respectively.

Buccal aperture very narrow, measuring only 0.26 mm wide in the sixth whorl. Its height is unknown.

Chomata have not been observed, probably absent.

Proloculum spherical, small, thickwalled, with a diameter of 0.14 mm.

Axial fillings are well developed as two long bars; their inner ends lying with a small clear space from the proloculum and their outer ends advancing to the very terminations of the sixth whorl if not intruding the polar regions of the last volution. The specific name comes from this feature.

Remarks: At first glance, this form seems to be very similar to *Schwagerina chihsiaensis* Lée. But under strict examination the present species is yet easily distinguished from the latter in having an evenly constructed test and a more regular folding of the antethecae. The axial fillings are well developed in the two forms. It is to be noted, however, that in *Schwagerina chihsiaensis* Lee they always start from the very neighbourhood of the proloculum, while in the present form they appear at some distance from it. The proloculum of this new species is smaller than that of the Chihsia form, though in small quantity. Despite the fact that *Schwagerina chihsiaensis* and *Schwagerina pseudochihsiaensis* Chen have a proloculum comparable in size with that of the present species, they are readily recognizable by the simple and somewhat irregular antethecal folding.

Horizon and locality: This species is found in rare occurrence in the Wuhsueh Limestone in the hills 10 kilometres west of Wuhsueh, Kwangchi County, Hupeh Province. It is also represented merely by a median section in our collection from the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.

### *Schwagerina yüi* Chen sp. nov.

(Pl. II, fig. 19)

This species is represented only by an incomplete axial section, but the characteristics are distinctly displayed. The test is elongately fusiform with an axial length of about 5.38 mm and a median width of 1.15 mm. The proportion of the latter to the former is nearly 1:4.6. There are five compact whorls in this specimen. The median zone of the test is slightly vaulted and the terminations are pointed.

The spirotheca is exceedingly thin but slowly thickening outward, having a thickness of only 0.04 mm in the last volution. The alveolar structure of the keriotheca is moderately fine.

The antethecae regularly fluted to form round folds in the lower 2/3; a simple network is produced in each of the polar regions. The number of the antethecae is unknown.

On account of poor preservation, the shape of the buccal aperture cannot be clearly observed.

Chomata not developed.

Proloculum nearly circular in the axial section, having a diameter of 0.20 mm.

This form is characterized by the elongate test, few whorls, and particularly the thin spirotheca. It is named after Mr. T. Y. Yü.

The width of the whorls is found as follows (in mm):

I	0.31
II	0.41
III	0.59
IV	0.82
V	1.15

Horizon and locality: This species associates with *Chusenella deprati* Ozawa in the lower part of the Wuhsueh Limestone, Tienchiachung, Kwangchi County, Hupeh Province.

### *Schwagerina skinneri* Chen sp. nov.

(Pl. II, figs. 13—15)

Test fusiform, considerably vaulted in the median zone and bluntly pointed at the poles. The axial length measures 5.03 mm and the median width 2.36 mm from a specimen with six whorls; the axial ratio is 1:2.2. The two dimensions reach as much as 6.21 mm and 3.10 mm in another case. Whorls are fusiform and rather loose, 6 in number. In a para-axial section they are counted up to 8½.

The result of one measurement is given as follows:

	Whorls						Specimen
	I	II	III	IV	V	VI	
Width (in mm)	0.47	0.62	0.88	1.14	1.48	1.95	4826
Thickness of spirotheca (in mm)	0.027	0.034	0.034	0.041	0.048	0.054	

Spirotheca thin and slender, slowly increasing in thickness outward; the keriothecal alveoli moderately fine.

Antethecae exceedingly thin, gently and somewhat irregularly fluted into round folds in the small lower part of the surface. The polar portion of the antethecae is folded to form simple and loose networks. The antethecal number is not known.

Buccal aperture narrow but fairly high. The angle of the tunnel is 25°—37°.

Chomata obsolete, only leaving vestiges on the outer surface of the proloculum.

Axial fillings entirely wanting.

Proloculum spheroidal, 0.28 mm in diameter.

Remarks: This form is characterized by the robust test, the thin and slender spirotheca, the simple folding of the antethecae and the large proloculum. The name is proposed in honor of John W. Skinner.

Horizon and locality: It is found in rare occurrence in the lower beds of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province. *Schwagerina multialveola* Chen, *Schwagerina hunania* Chen, *Chusenella douvillei* Colani, *Schwagerina megalocula* Chen, *Chusenella tingi* Chen, *Schwagerina paralpina* Chen and *Chusenella deprati* Ozawa are the associates of this species.

***Schwagerina tienchiaensis* Chen sp. nov.**

(Pl. III, fig. 1)

Test rather fusiform with the median zone more or less cylindrical and the extremities pointed. The axial length is 5.86 mm, and the median width is roughly estimated at 2.51 mm for the median zone of the test is broken. Whorls close and the first three more so. The number of whorls is  $6\frac{1}{2}$ .

The widths of the whorls are (in mm):

I	0.38
II	0.53
III	0.77
IV	1.06
V	1.48

Spirotheca thin and slender, 0.06 mm thick in the fifth volution; the alveolar structure in the keriotheca is fairly coarse.

Antethecae simply and irregularly fluted in the inner four whorls and intensely folded into compressed folds in the outer volutions. The antethecal number in the successive whorls is unknown.

Buccal aperture extremely narrow and low, measuring only 0.11 mm wide in the fifth volution.

The presence of chomata has not been clearly ascertained, they are absent in most cases.

Axial fillings wonderfully developed in two very large irregularly conical masses, occupying almost the whole lateral portions of the test leaving only less than one third of the median region free of deposits.

Proloculum spheroidal thick-walled, 0.26 mm in diameter.

This species is recognized by the thin spirotheca, the compact folding of the antethecae and especially the monstrous development of the axial fillings.

Horizon and locality: It associates with *Chusenella deprati* (Ozawa) in the Wuhsueh Limestone in the hills adjoining the town of Tienchiachun, Kwangchi County, Southeastern Hupeh.

***Schwagerina exilis* Schwager**

(Pl. III, figs. 6, 7)

1883. *Fusulina exilis*, Schwager: *China*, Vol. IV, p. 125; Pl. XV, fig. 15; Pl. XVI, figs. 4, 5.

1914. *Fusulina exilis*, Deprat: *Mém. Serv. Géol. l'Indochine*, Vol. III, Fasc. I, p. 17; Pl. II, figs. 6-8.

1925. *Schellwienia exilis*, Ozawa: *Journ. Coll. Scien.* Vol. XIV, Art. 6, pp. 33, 34.

Test fusiform, gently vaulted in the median zone, pointed at the ends. In a specimen with six whorls the axial length is 5.41 mm and the median width 2.01 mm; the form ratio is 1:2.7. All the whorls are fusiform, rather regular and moderately loose; their height increases slowly in the spiral direction and keeps almost constant in the axial direction to the vicinity of the poles where the polar parts of the outer whorls more extended laterally. The number of whorls is 6 or 7.

The widths of the whorls are (in mm):

I	0.50
II	0.71
III	1.03
IV	1.51
V	2.04
VI	2.57

Spirotheca thin, slowly increasing in thickness as it coils outward. Its thickness in the sixth whorl measures only 0.06 mm. The alveoli in the keriotheca are rather fine.

The septa in the first two volutions almost unfluted in the large median portion. Those in the next volutions are folded into round loops in the lower 2/3 of the surface.

Buccal aperture moderately broad, about 1/8 the length of the whorl; its height is about 1/2 that of the respective chamber.

Chomata only developed as two small ridges in the two inner whorls, becoming obsolete in the succeeding volutions.

Proloculum subcircular in axial section; its diameter measures 0.29 mm.

**Horizon and locality:** It occurs in association with *Verbeekina verbeeki* Geinitz and *Neoschwagerina* sp. in the lower part of the Chingsichung Limestone at Fengkuanshan, Hsianghsiang County, Hunan Province. This species is also found together with *Verbeekina verbeeki* Geinitz and *Neoschwagerina douvillei* Ozawa in the Maok'ou Limestone, Chienkiang, Kwangsi Province.

### ***Schwagerina lingyunensis* Chen sp. nov.**

(Pl. III, figs. 8—10)

Test subcylindrical; the axial length is 5.12 mm and median width 1.92 mm measured from a specimen of five whorls; the form ratio is about 1:2.7. All the whorls are moderately loose; the polar parts of the outer volutions considerably expanded. The number of whorls is 5 or 6.

The widths of the whorls are given below (in mm):

I	0.53
II	0.78
III	1.08
IV	1.50
V	1.92

Spirotheca thin but slowly thickening toward the outer whorls. It measures about 0.06 mm thick in the sixth whorl.

The entire surface of the septa is intensely fluted into high folds. The septal number is 8 in the first whorl, 15 in the second, 19 in the third, and 22 in the fourth.

The shape and size of the buccal aperture are not known; the tunnel appears to be narrow.

Chomata not developed.

Axial fillings entirely absent.

Proloculum spheroidal, large, up to 0.40 mm in diameter.

This species is characterized by the thin spirotheca, the intensely folded septa and the large proloculum.

**Horizon and locality:** It occurs in abundance, associated with *Cancellina schellwieni* Deprat in the Maok'ou Limestone at Lingyun, Kwangsi Province.

### ***Schwagerina mengi* Chen sp. nov.**

(Pl. V, figs. 1—3)

Test large, short-fusiform with a considerably vaulted median zone and pointed ends; the axial length is 0.47 mm and the median width 5.62 mm, the form ratio is 1:1.7; whorls loose, regularly increasing in height while winding outward; whorls are 6 or 7 in number.

The widths of the whorls are as follows (in mm):

Specimen	(6295)	(6181)
Proloculum	0.56	0.62
I	1.03	1.03
II	1.55	1.52
III	2.07	2.32
IV	2.76	3.19
V	3.70	4.15
VI	4.82	5.09

Spirotheca very thick in the median portion, plainly declining in strength toward the poles; it measures about 0.17 mm thick in the sixth volution; the alveoli of the keriotheca rather coarse.

Antethecae rather thick, intensely fluted transversely into somewhat irregular, narrow folds almost for the entire surface; the antethecal number is roughly counted up to forty in the sixth volution in a slightly oblique transverse section.

Buccal aperture not well defined; the tunnel very narrow even in the outer whorls.

Chomata completely absent.

Proloculum large, spheroidal or spherical with a diameter of 0.56 to 0.59 mm.

Remarks: The more evolute form of the present species is similar to the short type of *Fusulina chamchitensis* Colani in the loose whorls, the thick spirotheca, the intensely-fluted antethecae and the large proloculum; but the compact form differs from the Indochina species in building tighter and more whorls.

Deprat's *Fusulina globosa* also shows some resemblance to the present form in internal structures, but its test is more globular than that of the latter.

The faunal association is also different. According to Colani, *Fusulina chamchitensis* associates with *Schwagerina princeps* Ehrenberg in the upper Uralian of Indochina. Deprat's form also occurs together with the Uralian species such as *Fusulina complicata* Schellwien, *Fusulina tenuissima* Schellwien etc. But our species is found in association with the Permian species, in which *Neoschwagerina craticulifera* Schwager and *Verbeekina verbeeki* Geinitz are the leading forms.

Therefore, our form evidently occurs in a higher horizon than the other two species.

In any case the three forms should have some genetical affinity for they developed so many similar essential features that sometimes difficulties rise in the distinction among them.

Horizon and locality: This species occurs in association with *Schwagerina yunnanensis* (sp. nov.), *Verbeekina verbeeki* Geinitz and *Neoschwagerina craticulifera* Schwager in the Maok'ou Limestone, Ning-erh, Yunnan Province.

### *Schwagerina brevipola* Chen sp. nov.

(Pl. V, figs. 4—7)

Test small, ellipsoidal; the median zone regularly inflated and the poles short and rounded. From the latter feature the specific name is derived. The axial length is 4.46 mm, the median width 2.36 mm, and the axial ratio 1:1.9 in a typical form with 7 whorls. The first whorl spheroidal, the second and the third volution fusiform, and all the three are very close; other whorls are ellipsoidal and comparatively loose. The height of the outer whorls shows no variation in the axial direction. The number of whorls is 7.

The widths of the whorls and the thickness of the spirotheca are given below:

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.20	0.31	0.41	0.65	1.15	1.76	2.36	5470
Thickness of spirotheca (in mm)	0.013	0.023	0.034	0.041	0.054	0.068	0.068	

Spirotheca exceedingly thin in the inner compact whorls, but rapidly thickening in the outer ones. The thickness of the spirotheca is conspicuously reduced from the median zone toward the poles. Alveoli in the keriotheca moderately coarse.

Antethecae in general may be said to be thick, but still much thinner than the spirotheca in the outer whorls. They are fluted into low and round folds in the lower half of the surface; the polar parts of them are twisted to produce fine anastomoses which are pierced by minutes holes and appear finally broken in sections. The antethecal number is unknown for the median section has not been obtained.

Buccal aperture narrow but rather high, possibly not well defined. The angle of the tunnel is  $32^\circ$ .

Chomata weakly built in the early close whorls, but absent in the rest.

Axial fillings are poorly represented in slight irregular masses only in the lateral regions of the first four whorls.

Proloculum small probably spheroidal, having a diameter of 0.14 mm.

Remarks: This form has some resemblance to the young specimen of *Schwagerina multialveola* Chen, but can be distinguished by the slighter folding of the antethecae and the coarser alveoli of the keriotheca. As to the latter feature the partitions or fibres between the alveoli, as seen in section, are very thin and besides a kind of shorter partitions is inserted between the longer ones in *Schwagerina multialveola* Chen. In the present species the so-called partitions are thicker and the short partitions not developed. It differs from *Chusenella deprati* Ozawa in having a more ellipsoidal test. The earlier compact whorls are more numerous in the latter species and the axial fillings are almost always fully developed, but in the present form they are poorly deposited and sometimes almost entirely obsolete.

Horizon and locality: It occurs in the lower part of the Chingsichung Limestone in the hills about 2.5 kilometres west of Hungshantien Street, Hsianghsiang County, Hunan Province. A specimen with conspicuous axial fillings may represent this species in the same limestone in the hills, south of Hutien in the County. In the second locality it is found in association with *Schwagerina multialveola* Chen and *Sumatrana annae* Volz. Its association in the first habitat is as yet not known.

### *Schwagerina multialveola* Chen sp. nov.

(Pl. V, fig. 8)

Test generally fusiform; the median zone fairly inflated and the poles rather protruded with the terminations truncated. This latter feature is only acquired in the mature forms but wanting in the younger specimens. The axial length and the median width measure respectively 6.98 mm and 3.04 mm from an adult specimen which possesses nine whorls. The axial ratio is nearly 1:2.3. The first three or four volutions are very tight, while the later ones rather loose. The ends of the inner whorls are pointed but those of the final three fairly expanded to form round terminations. The number of whorls attains to 9 in maturity.

The width of the whorls and the thickness of the spirotheca measured from the successive volutions are given below:

	Whorls									Specimen
	I	II	III	IV	V	VI	VII	VIII	IX	
Width (in mm)	0.15	0.23	0.34	0.45	0.74	1.07	1.68	2.38	3.04	4831
	0.15	0.22	0.32	0.47	0.70	1.05	1.61	2.22		4789
Thickness of spirotheca (in mm)	0.01	0.013	0.027	0.020	0.041	0.048	0.068	0.054		4831

Spirotheca particularly thin in the first four coils, but thickening rather rapidly in the rest; the last part becomes a little thinner again, indicating the presence of the adult stage. The thickness of the spirotheca varies axially from

place to place. Though rather thick, the spirotheca appears gently waving along the direction of the axis of convolution. The alveoli in the keriotheca are rather coarse, especially in the outer volution where the fibres pronouncedly thicken downwards. There is a sort of shorter fibres making first appearance in the seventh whorl, intercalating usually one and occasionally two between the long ones. These short fibres are one fourth or more as long as the primary.

The antethecae in the first three or four whorls are unfluted in the median large area, but gently wrinkled in the lateral regions. Those in the middle volutions are folded into round loops in the lower two thirds of the antethecal surface, while those in the last coils are intensely and more or less irregularly fluted for the whole surface. In the median section the septa appear rather flexuous, and several of them in the subsequent whorls united together with the lower parts into pairs. The antethecae number 9, 9, 11, 14, 18, 20, 23 and 25 respectively in eight successive volutions.

The polar parts of the antethecae in the two outermost whorls are highly complicated to produce a complex anastomosis in which the partitions of the meshes are much pierced by the minute septal pores. This feature is very peculiar to this species.

The buccal aperture is narrow but rather high. It has a breadth  $1/12$  the length of the whorl and a height  $1/2$  that of the corresponding chamber.

Chomata are entirely lacking.

Axial fillings only deposited in the lateral regions of the inner whorls as two narrow bars. The polar regions of the few outermost whorls are always free from them. In one case they are represented merely by several isolated small masses along the axis.

Proloculum minute, spherical and thin-walled. It has a diameter of 0.09 mm.

Horizon and locality: It occurs in the lower part of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province. Associated with the present form is *Sumatrana annae* Volz.

### *Schwagerina suni* Chen sp. nov.

(Pl. V, fig. 9)

Test subcylindrical, slightly vaulted in the median zone and rounded at the poles. The axial length is 6.98 mm, the median width 3.04 mm, and the axial ratio 1:3. The first whorl is somewhat ellipsoidal, the next four fusiform and the last three or four subcylindrical. The height of the whorls increases slowly and regularly forward as the volutions are added. The lateral parts of the inner whorls are more extended laterally while those of the last two or three only expand crosswise to the axis and are little elongated in the axial direction. The number of whorls is  $8\frac{1}{2}$ .

The result of a measurement is as follows:

	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.35	0.56	0.74	1.05	1.41	1.78	2.33	2.75	4790
Thickness of spirotheca (in mm)	0.014	0.027	0.034	0.048	0.054	0.061	0.048	0.049	

Spirotheca is very thin and slowly thickens outward. Its thickness does not keep constant in the direction of the axis. The tectum is particularly thin and the alveoli in the keriotheca are moderately fine.

Antethecae fluted into low folds in the vicinity of the aperture. The folding becomes intense toward the poles, and at the same time the folds grow higher. The umbilical parts of the septa in the inner whorls are fluted into rather loose networks, but those in the last few whorls are strongly twisted to form fine reticulations. The median section of the test is not yet prepared so that the septal number is unknown.

Buccal aperture slit-like, moderately high but rather narrow, its breadth being nearly  $1/8$  the length of the whorl.



Chomata weakly developed as two small ridges in the inner whorls, but completely obsolete in the outer ones.

Proloculum small, circular in axial section, having a diameter of 0.20 mm.

This name is proposed in honour of Dr. Y. C. Sun.

Horizon and locality: This species is found in rare occurrence with *Sumatrana annae* Volz and *Schwagerina paralpina* Chen in the lower part of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.

***Schwagerina chinensis* Chen sp. nov.**

(Pl. V, fig. 10)

Test large, robust, fusiform; the median zone considerably inflated, the poles somewhat produced and terminated in round extremities. A marked though slight constriction is present near each pole. The axial length measures 10.44 mm from a specimen with seven whorls; the median width cannot be determined for the median zone of the measured test is partially broken, and consequently the axial ratio of the mature form is also unknown. But the proportion of the width to the length of the fifth volution, which is complete, is nearly 1:2. In any case, the axial ratio of the mature test is decidedly not much different from the above figures, because the fifth whorl can represent the general shape of the test. The two inner whorls rather close, the outer ones more evolute; and the first five more regularly fusiform volutions are with short ends, while the others with more protruded poles. The number of whorls is 7.

The widths of the first five whorls and the thickness of the spirotheca are shown in the following figures:

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.56	0.88	1.48	2.28	3.51	—	—	5445
Thickness of spirotheca (in mm)	0.027	0.027	0.034	0.035	0.041	0.041	0.027?	

Spirotheca very thin, slowly increasing in thickness with the addition of the number of whorls. The strength of the spirotheca persists axially to the very polar regions. The keriotheca is thin and with a fine alveolar structure.

Antethecae somewhat irregularly fluted into broad folds mostly confined to the lower 2/3 or more. The polar parts of the antethecae in the inner whorls are folded to form simple networks, but in the polar regions of the outer volutions moderately complex anastomoses are resulted from the fluting of the extreme parts of the antethecae. Unfortunately no transverse sections have come into my possession. Therefore the number of antethecae in the successive volutions is yet unknown.

Buccal aperture is very low and narrow; the angle of the tunnel is 27° in the early whorls.

Chomata completely absent.

Axial fillings not developed, only several meshes of the network in the first and second whorls filled up in rare cases with scattered calcareous deposits.

Proloculum spheroidal, moderate in size, thick-walled, having a diameter of 0.37 mm.

This species may be recognized by the large test, the loose whorls, the thin spirotheca, the simple antethecal folding and the large proloculum.

Horizon and locality: This species is found in rare occurrence in the basal beds of the Wuhsuch Limestone in the hills near Tienchiachun, Kwangchi County, southeastern Hupeh. Its association is not clear.

***Schwagerina hunania* Chen sp. nov.**

(Pl. III, figs. 11—13)

Test subcylindrical with the median zone slightly vaulted and the poles rounded. All the whorls are subcylindrical

and closely and regularly coiled; the ends of the inner four whorls are more pointed while those of the last two are round. The axial length and the median width of a specimen having  $7\frac{1}{2}$  whorls are 6.60 mm and 2.39 mm respectively. These two dimensions vary but slightly in the typical tests of this species. The axial ratio is 1:2.7. The number of whorls is 7 or  $7\frac{1}{2}$  in the mature forms.

Some measurements are tabulated below:

	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.34	0.47	0.69	0.99	1.39	1.89	2.47	3.02	5521
	0.28	0.44	0.65	0.91	1.24	1.62	2.16		4803
Thickness of spirotheca (in mm)	0.013	0.020	0.034	0.041	0.048	0.054	0.061		4803

Spirotheca thin, slowly increasing in thickness as the test growing forward and its strength persisting for a long distance in the axial direction. The tectum is exceedingly thin and the alveolar structure of the keriotheca fine.

Antethecae very thin, fluted into widely spaced and nearly quadrate folds in the lower half of the lateral surface. The umbilical parts of the antethecae are folded together to form moderate-meshed anastomoses. As the median section of the test has not been prepared, the antethecal number in the successive volutions is consequently unknown.

Buccal aperture slit-shaped, very low but moderately broad in the outer whorls.

Chomata appear to be represented by some ill-defined minute masses in the three innermost whorls, but entirely disappear in the outer volutions.

Proloculum small, spheroidal, thin-walled, with a diameter of 0.22 mm.

Axial fillings are not present.

Horizon and locality: The present species occurs together with its allied forms *Schwagerina chinensis* Chen and *Sumatrina annae* Volz in the lower part of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.

### *Schwagerina yunnanensis* sp. nov.

(Pl. IV, figs. 1—3)

Test short fusiform with the median zone moderately vaulted and the poles bluntly pointed; the axial length varies between 6.51 mm and 7.10 mm, the median width between 2.66 mm and 2.72 mm; the form ratio ranges from 1:2.4 to 1:2.6; all the whorls are fusiform and closely and regularly coiled; the number of whorls is 6 or 7.

The results of two measurements are given below:

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.23	0.46	0.69	1.02	1.45	1.99	2.66	6311
	0.25	0.50	0.65	0.91	1.24	1.67	2.19	6323

Spirotheca thin, gradually increasing in thickness towards the outer whorls; it measures 0.08 mm thick in the seventh volution; the keriotheca has rather coarse alveoli and appears as early as the beginning of the spirotheca.

Antethecae moderately thick, regularly fluted to form subquadrate folds in the lower part of the surface in the inner whorls; the intensity of the antethecal folding in the last volutions increases to such an extent that the entire lateral surface is wrinkled to produce crowded narrow folds; the polar area of the antethecae in the last two or three volutions

is highly twisted into fine anastomoses, in which the walls of the meshes are pierced by minute foramina to give a broken appearance to the section of the networks. The antethecae number 10, 17, 23, 29, 30, and 37, respectively in the first six successive volutions.

Buccal aperture rather wide and high, the breadth being  $1/8$  the length of the respective whorl and the height  $1/2$  that of the chamber. Chomata not developed.

Axial fillings well deposited in large masses in the lateral regions of the first five whorls.

Proloculum spheroidal, small, 0.23—0.37 mm in diameter.

Horizon and locality: It associates itself with *Verbeeķina verbeeķi* Geinitz and *Neoschwagerina craticulifera* Schwager in the Maok'ou Limestone, Ning-ēr, Yunnan Province.

### *Schwagerina longitermina* Chen sp. nov.

(Pl. IV, figs. 4—6)

Test large, fusiform, with the median zone considerably vaulted and both poles surprisingly elongated into the sub-cylindrical probosis with rounded ends. The lateral slopes are slightly depressed. In some forms one side of the median vaulted part is gently flattened. The axial length ranges from 9.59 mm to 11.07 mm and the median width from 3.43 mm to 3.57 mm; the ratio of the width to the length varies between 1:2.8 and 1:3.1. All whorls are fairly evolute and regularly increase in height as they coil forward. The inner four volutions are with short pointed ends and generally fusiform while the terminations of the outer whorls are much extended and expanded. The character of flatness on one side of the whorl makes first appearance early in the second volution, when the test develops this feature. The number of whorls of the mature specimen is 7.

Spirotheca thin but thickening slowly toward the outer part. The thickness in the median zone does not markedly vary axially but it reduces rather rapidly along the slopes toward the poles. The keriotheca develops a moderately coarse alveolar structure.

Septa intensely fluted into numerous compound folds. Those in the early whorls reach to the roof of the chamber, while those in the outer volutions but one rise upward to their upper margin. In the last whorl or even in the latter part of the sixth volution when the specimen only has six convolutions the strength of the antethecal fluting falls down to such an extent that only low and broad loops are formed in the median part of the septal surface; whilst the lateral parts of the last several septa are, as a rule, still subject to the influence of the strong folding. The polar parts of the septa are twisted to form complicated and round-meshed networks. In the median section of the test the septa in the inner whorls usually unite in pairs at the lower edges, while in the last two or three volutions this phenomenon is not apparently displayed. The septa number 15, 22, 30, 38, 32, and 30 respectively in six successive volutions. In the above list it is clearly seen that the greatest antethecal number is reached in the fourth whorl and thence the number falls down again markedly in the last two volutions.

Buccal aperture generally slit-like, but not well defined, moderately high but very narrow, its height being nearly half that of the chamber and its breadth only  $1/18$  the length in the sixth volution.

No trace of chomata has been observed; they are generally not developed.

Axial fillings small, irregularly conical with the bases facing the proloculum at some distance, and developed only in the lateral regions of the second and third whorls. The first whorl and the outer volutions are all free from any calcareous deposits.

Proloculum generally spheroidal, rarely kidney-shaped, with a diameter varying in the proximity of 0.26 mm. Its wall is rather thick.

Some measurements are given below:

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.37	0.65	1.08	1.61	2.28	2.93	3.55	4735
	0.59	0.97	1.54	2.13	2.78	3.43		4736
	0.53	0.91	1.48	2.20	2.87	3.57		4767
Thickness of spirotheca (in mm)	0.027	0.041	0.053	0.054	0.054	0.068		4736

In the above table the second and the third rows of figures can show the true rate of evolution of the whorls; the former is from a median section and the latter from an axial section with kidney-shaped proloculum. The numerals in the first row should be much smaller than the real values for the axial section is somewhat eccentrically cut through the proloculum.

Remarks: A possible comparison can be made between the typical forms of *Parafusulina multiseptata* (Schellwien) and the present species. The rate of evolution of the whorls and the folding of the septa in our species are truly concordant with the type of Schellwien's form. But the present form is still readily distinguished from *Parafusulina multiseptata* (Schellwien) by the highly produced poles and the much smaller proloculum. The axial fillings are almost always present in our form and usually represented in two small rough cones. On the contrary, they are sometimes developed and sometimes absent in Schellwien's species, and when occur they are often in small, loosely scattered irregular masses.

Horizon and locality. This species occurs in fair plenty in the lower part of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Central Hunan. It appears in association with *Chusenella douvillei* Colani and *Chusenella conicocylindrica* Chen.

### *Schwagerina hupehensis* Chen sp. nov.

(Pl. VIII, figs. 1—3)

Test elongately subcylindrical, slightly incurved, with the axial length varying between 7.69 mm and 11.18 mm and the median width between 1.89 mm and 2.51 mm. The axial ratio ranges from 1:4 to 1:4.4. In one case, one side of the median portion is rather vaulted and the opposite side nearly flat and the umbilical ends are blunt. In another specimen, the median zone is slightly inflated and the ends are more markedly truncated. The first three or four whorls are more compact and the next ones comparatively loose. The lateral parts of the outer whorls are usually much extended. The number of whorls is 7.

The widths of the whorls and the thickness of the spirotheca are tabulated below:

	Whorls							Specimen
	I	II	III	IV	V	VI	VII	
Width (in mm)	0.29	0.40	0.55	0.75	1.08	1.42	1.89	4725
Thickness of spirotheca (in mm)	0.024	0.027	0.030	0.041	0.064	0.068		

Spirotheca thin, gradually thickening forward and maintaining the constant thickness for a rather long axial distance. The tectum is fairly thick and the keriotheca has a fine alveolar structure.

Septa thinner than the spirotheca, not fluted in the first two whorls and gently folded into low folds in the next two volutions, but highly fluted to form crowded compact folds for the whole height in the last coils. The polar parts of the septa in the outermost whorls are twisted to produce fine anastomoses. The septal number is 12 in the first whorl, 18 in the second, 22 in the third, 25 in the fourth and fifth each, and 16 in the first half of the sixth.

Buccal aperture particularly low but rather wide. It has a height only 1/3 that of the chamber and a breadth 1/15 the length of the whorl in the sixth volution.

Chomata well developed though in weak strength up to the fifth or the sixth volution but entirely absent in the last whorls.

Axial fillings poorly deposited only in the lateral axial regions of the first two or three volutions.

Proloculum spherical, small, with a diameter of 0.19 to 0.23 mm.

Remarks: The curved form of the species is different from *Schwagerina bicornis* Chen in having a larger test and two more whorls. The round ends of the whorls and the absence of the axial fillings in the lateral part of the outer volutions are the striking points of difference utilizable to distinguish the present form from the other. In the rate of evolution of the whorls, the thickness of the spirotheca and the type of folding of the septa the present form bears some similarity to *Schwagerina verneuili* Möller. But the two forms can be distinguished by the fact that in *Schwagerina verneuili* Möller the terminations of the whorls are pointed and a long narrow axial filling is generally, if not always, developed in each of the lateral regions; while in *Schwagerina hupehensis* the condition is quite different that the ends of the outer whorls are rounded and those of the outermost one or two coils are sharply truncated in some cases, and the axial fillings are almost not developed or poorly represented as two small obscure masses in the first few volutions.

Horizon and locality: This species is found in the Wuhsueh Limestone, in the southern vicinity of Yüpingshan (玉屏山), Tiehchiachun, Kwangchi County, southeastern Part of Hupeh Province.

### *Schwagerina pactiruga* Chen sp. nov.

(Pl. VIII, figs. 4, 5)

Test more cylindrical than fusiform; the median zone gently vaulted, the poles more or less truncated. A slight constriction is usually present in each lateral zone. The axial length and the median width are 9.53 mm and 2.81 mm respectively in a specimen with eight whorls; the axial ratio is about 1:3.4. The first three whorls compact, the next one comparatively loose and gradually evolving outward. The early five coils are fusiform; the lateral parts of the other volutions highly extended and meanwhile expanded to make these whorls and consequently the test become subcylindrical. Whorls are many, usually 8 in the mature form.

The rate of evolution of the whorls and the strength of the spirotheca are shown by the following figures:

	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.23	0.34	0.50	0.79	1.19	1.70	2.28	2.81	4753
	0.25	0.35	0.59	0.94	1.39	1.89			4754
Thickness of spirotheca (in mm)	0.013	0.013	0.027	0.032	0.047	0.054	0.064	0.068	4753

Spirotheca thin, regularly and gradually thickening as it coils forward. The strength remains fairly persistent for a great axial distance. The alveoli in the keriotheca are rather fine.

Antethecae unfluted in the first whorls, gently folded in the second and third volutions. Those in the other coils strongly fluted into tightly compressed folds for the entire septal surface. However, in the latter part of the last whorl the strength of folding of the septa much declines to such an extent that the folds almost entirely disappear in the large median space of the chamber. The polar parts of the septal surface in the outer four volutions are highly twisted to form fine and complex anastomoses. The numbers of septa are roughly 27, 31, and 33 respectively in from the fourth to the sixth volution.

Buccal aperture low and narrow, measuring only 0.38 mm broad in the seventh volution; the angle of the tunnel is 32°.

Chomata appear very feebly developed in the innermost three whorls and are entirely absent in the outer ones.

Axial fillings irregularly deposited in the lateral regions of the inner five coils; the inner ends lying at a very short distance from the proloculum.

Proloculum spheroidal, minute, 0.17 mm in diameter.

Remarks: It cannot be denied that there is a great affinity between *Schwagerina longitermina* Chen and the present form. The important points of difference which may be used to separate the two forms lie in the closer whorls as well as the less vaulted median zone of the test of the present species. That the rate of evolution of the whorls is plainly represented in two stages in the species under consideration is another essential difference. The septal folds in the middle volutions are so tightly pressed laterally that almost no open room is left inside. This phenomenon is not so pronounced in *Schwagerina longitermina*. It is distinguished from *Chusenella conicocylindrica* (sp. nov.) by the more cylindrical test and the more regular folding of the septa. The early whorls in the latter species are much more compact and the axial fillings are in low and broad cones. The last feature in the present form is represented by two irregular and narrow bars.

It differs from *Schwagerina hupehensis* (sp. nov.) in the more fusiform shape of the test, the smaller proloculum and the well-developed axial fillings.

Horizon and locality: This form is found alone in the lower part of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.

### *Schwagerina granum-avenae* Roemer

(Pl. VIII, figs. 6—10)

1880. *Fusulina granum-avenae*, Roemer: Über eine Kohlen kalk fauna der Westkuste von Sumatra, *Palaeontogr.* XXVII, pp. 1—11.
1896. *Fusulina granum-avenae*, Verbeek and Fennema: Java et Madoura, Part 2, p. 1131, Pl. I, figs. 1—10.
1912. *Fusulina granum-avenae*, Deprat: Étude géol. Yunnan Oriental, Part III, p. 26.
1915. *Fusulina granum-avenae*, Schubert: Die Foraminiferen des jüngeren Paleozoikums von Timor, Pl. XXXIX, fig. 1, Pl. XLI, figs. 5—6, p. 53.
1925. *Schelluienia granum-avenae*, Ozawa: *Journ. Coll. Science*, Vol. XLV, Art 6, pp. 29—30, Pl. VI, fig. 6.

This species is represented in two generations. The microspheric test subcylindrical, slightly flexuous, more or less vaulted in the median zone, rounded and sometimes truncated at the extremities. The axial length ranges from 12.13 mm to 12.66 mm, the median width from 2.93 mm to 3.34 mm; the axial ratio varies between 1:3.8 and 1:4.1. Whorls numerous, close, regularly evolving in the median region. The polar portions of the last whorls are frequently much extended laterally. The number of whorls is usually 8 or 9, rarely 10. In the macrospheric generation, the condition is somewhat different. The test seems to be more fusiform than cylindrical. The median zone conspicuously vaulted, the ends rounded. The length and the width of the test measures 7.25 mm and 2.69 mm respectively, the axial ratio is 1:2.7. All the whorls are also fusiform, compact and rather regular,  $7\frac{1}{2}$  in number.

Several measurements from the microspheric and one from the macrospheric forms are shown in the following table:

	Whorls									Specimen
	I	II	III	IV	V	VI	VII	VIII	IX	
Width (in mm)	0.29	0.44	0.62	0.83	1.09	1.48	1.95	2.45		4657
	0.26	0.38	0.53	0.71	0.97	1.30	1.74	2.22	2.69	4672
	0.32	0.50	0.59	0.77	1.03	1.36	1.73	2.18	2.63	4698
	0.56	0.75	0.94	1.29	1.56	1.95	2.45			4702
Thickness of spirotheca (in mm)	0.020	0.020	0.027	0.027	0.048	0.055	0.082	0.082		4657

Spirotheca thin in the early whorls, gradually thickening in the next coils. The strength may remain for a great axial distance. Alveoli in the keriotheca are fine.

Septa thin, gently fluted into low folds in the lower half of the median surface; the folding increasing in intensity towards the poles, where the septal surfaces are twisted to produce complicated anastomoses. The septal number is not yet correctly determined.

Buccal aperture low and narrow in the inner whorls, but rather wide in the outer coils. The angle of the tunnel is  $47^{\circ}$ .

Chomata have not been clearly observed and are possibly not well developed if not absent.

Axial fillings are poorly deposited as two small irregular bars in the lateral regions of the few innermost whorls and in some cases they are completely absent.

Proloculum spheroidal, minute, with a diameter of 0.20 mm in the microspheric forms; irregularly round with a diameter of 0.41 mm in the other generation.

Horizon and locality: This species occurs together with *Chusenella deprati* Ozawa, *Chusenella douvillei* Colani and *Schwagerina yui* Chen in the lower part of the Wuhsueh Limestone in the hills near Tienchiachun, Kwangchi County, Hupeh Province.

### Genus *Chusenella* Hsu, 1942, emed. Chen, 1955

**Genotype** *Chusenella ishanensis* Hsu, 1942, *Bull. Geol. Soc. China*, vol. 22, pp. 175, 176 text figs, 1, 2.

Test moderate in size, inflated-fusiform, with ventricose median portion and pointed ends; whorls numerous, attaining to 9 or 10 in mature forms, the inner whorls very tight, the outer ones rather loosely and regularly expanded; spirotheca consisting of tectum and fine keriotheca, thin, slender and increasing slowly in thickness; septa not fluted in the inner tight volutions, but strongly and regularly fluted almost for the whole septal surface, the folds are tight, sometimes with nearly parallel sides, and forming fine networks in the polar regions of the volutions; chomata only developed as two fine spirals in the juvenile whorls but entirely absent in the outer whorls; axial fillings are developed only in the proximity of the proloculum; aperture singular; proloculum small and spherical.

Range: Higher Permian.

Remarks: This genus was established by J. S. Lee and Y. T. Hsu in 1942. They diagnosed this genus on the deceptive structures of the tight septal folds which were then considered as parachomata. I have closely reexamined the type specimens and discovered that the so-called dichotomous and perforated parachomata are truly the basal part of the very tight septal folds but not true parachomata.

The median section of *Chusenella ishanensis* Hsu given in a paper by Mr. Hsu has quite different structures from the axial section of the genotype. The spirotheca is composed distinctly of a tectum, a fine keriotheca and an inner tectorium; this last figure, although very thin, is constant for all the whorls. The septa are rather distant-spaced and slightly undulated. I believe that this median section does not belong to the genus of *Chusenella* but belongs to a certain species of *Misellina*.

*Chusenella* very resembles *Paraschwagerina* in the general shape, the strong and regular septal folding, the axial fillings, the small proloculum and the very tight juvenile volutions, but it can be easily distinguished from the latter by the almost plane septa in the juvenarium. Ontogenetically *Paraschwagerina* is derived from *Schwagerina* but *Chusenella* certainly from *Triticites*.

Range: Permian of the Tethys Sea area.

### *Chusenella tingi* Chen sp. nov.

(Pl. II, figs. 1—3)

The present species is represented by several specimens in the collection. The test is constructed with regular



fusiform whorls. In some cases the median zone considerably vaulted, the lateral parts sloping smoothly towards the pointed ends. The length is 4.05 mm, the width 1.77 mm; the proportion of the latter to the former is 1:2.3. The three inner whorls particularly compact, the outer ones moderately loose. The height of the whorl does not perceptibly vary along the direction of the axis.

For the sake of easy recognition the probable values of the whorl-width are given as follows (in mm):

Diameter of Proloculum	0.08
I	0.11
II	0.17
III	0.25
IV	0.35
V	0.53
VI	0.80
VII	1.27
VIII	1.77

Spirotheca exceedingly thin in the early volutions, becoming a little thicker in the next ones and at the same time very slowly thinning off toward the poles. It measures but 0.04 mm thick in the last part. The alveoli in the keriotheca are rather coarse.

Septa almost not fluted in the first three volutions, folding into fairly regular folds in the lower more than 2/3 of the vertical surface in the next two or three coils, where the area above the buccal aperture is also influenced by the folding. In the last few whorls the folding of septa becomes more or less irregular. The number of septa is unknown.

Buccal aperture slit-like, very narrow and low.

Chomata feebly developed only in the several innermost whorls, disappearing in the outer ones.

Two narrow but long axial fillings disposed each in one of the lateral axial regions.

The shape and size of the proloculum are not yet clearly made out, but it is probably very small.

Remarks: This form is distinguished from *Chusenella deprati* Ozawa chiefly by the strictly spindle-shaped test. The exceptionally regular whorls and the truly pointed poles are also the important features available for specific distinction. It differs from *Schwagerina regularis* Schellwien in the more vaulted median zone, the more pointed ends, the compact early whorls and the well developed axial fillings. This name is proposed in honor of the late Dr. V. K. Ting.

Horizon and locality: It occurs together with *Chusenella deprati* Ozawa in the lower part of the Chinghsichung Limestone, about 2.5 kilometres south of Hutien Town, Hsianghsiang County, Hunan Province.

### *Chusenella deprati* Ozawa

(Pl. II, figs. 16—18)

1912. *Fusulina exilis*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. I, Fasc. 3, p. 24, Pl. VIII, figs. 13—14, Pl. VII, fig. 16.

1913. *Fusulina exilis*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. II, Fasc. 1, p. 11.

1925. *Schellwieni deprati*, Ozawa: *Jour. Coll. Scienc.* Vol. XLV, Art. 6, pp. 34—35, Pl. V, figs. 6, 7.

Test fusiform, considerably vaulted in the median zone, bluntly pointed at the ends which are rather short. The axial length varies from 4.64 mm to 6.09 mm, the median width from 2.57 mm to 2.69 mm; the axial ratio between 1:2.1 and 1:2.6. All the whorls are regularly fusiform. The first three or four volutions are extremely close while the next ones rather loose. This last feature is very persistent throughout the specimens procured in our material. The number of whorls in the mature forms is 7 or 8.

The widths of the whorls and the thickness of the spirotheca are given in the following table:



	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.17	0.26	0.35	0.50	0.77	1.15	1.71	2.32	4774
	0.17	0.23	0.35	0.50	0.74	1.08	1.51	1.98	4795
	0.20	0.26	0.32	0.48	0.77	1.21	1.86	2.57	4952
	0.16	0.25	0.34	0.50	0.77	1.09	1.62	2.19	4953
Thickness of spirotheca (in mm)	0.008	0.008	0.008	0.022	0.034	0.048	0.075	0.089	4952
	0.32	0.46	0.59	0.88	1.31				5168

Spirotheca particularly thin in the inner compact whorls, becoming rather thick in the outer ones. And the thickness varies here and there along the axial direction. The alveoli in the keriotheca are fairly coarse.

Antethecae almost unfluted in the early close volutions, fairly regularly folded for more than 2/3 the height in the next coils, the apertural area being also affected by the folding. They are counted 7, 14, 14, 16, 17, 18, and 23 respectively in seven succeeding volutions.

Buccal aperture very narrow but high, about half as high as the chamber and measuring 0.29 mm broad in the seventh whorl.

Chomata developed in weak strength in the early compact whorls but obsolete in the next volutions.

Axial fillings are always present and represented by two moderate more or less irregular masses with the inner ends lying at a little distance from the proloculum.

Proloculum spheroidal, minute, no more than 0.12 mm in diameter in the microspheric types, while it measures up to 0.20 mm in the macrospheric forms.

Remarks: This species is represented by both microspheric and macrospheric generations in our collection. The microspheric form is quite similar to the specimens of Deprat's *Fusulina exilis* illustrated in Pl. VIII, figs. 13—14 in having three or four extraordinarily closely coiled whorls at the beginning, a minute proloculum, and some other essential features. Schwager's *Fusulina exilis* from Akasaka Limestone in Japan has a larger test with less volutions and a larger proloculum. Furthermore, *Fusulina exilis* Schwager has not more compact inner whorls. The median section of Otawa's *Schellwienia deprati* is almost identical with a specimen in our material except for the fact that the number of antethecae in our form is smaller than that in the Japanese specimen.

Horizon and locality: This species is represented by moderately abundant specimens in the lower beds of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province. *Chusenella douvillei* Colani, *Verbeekina verbeeki* Geinitz, *Neoschwagerina craticulifera* Schwager and *Sumatrina annae* Volz are the associated forms in the former locality. It is also found in the Wuhsueh Limestone in the hills near the town of Tienchiachun, Kwangchi County, Hupeh Province.

### *Chusenella conicocylindrica* Chen sp. nov.

(Pl. IV, figs. 7, 8)

Test moderate in size, conico-cylindrical; the median part short, cylindrical and the lateral portions elongated, conical. The axial length is 6.57 mm and the median width 2.34 mm; the axial ratio is nearly 1:2.8. The first four whorls are subcylindrical and extremely close with the height of the chambers hardly greater than the thickness of the respective spiral-wall. The next whorls are conicocylindrical and moderately evolute. The lateral parts of the last two or three whorls are highly extended to form elongated poles, having a slight depression in each of the lateral slopes. The number of whorls is large, attaining to 9½.

The result of measurement is shown in the following table:

	Whorls									Specimen
	I	II	III	IV	V	VI	VII	VIII	IX	
Width (in mm)	0.15	0.02	0.28	0.37	0.53	0.79	1.17	1.61	2.10	4773
Thickness of spirotheca (in mm)	0.01	0.012	0.013	0.013	0.027	0.041	0.047	0.054	0.063	

Spirotheca exceedingly thin in the first four volutions and thence gradually thickening outward; the thickness remains unchanged in the median cylindrical portion but slowly decreases along the lateral slopes toward the poles. The alveolar structure in the keriotheca is moderately fine.

Antethecae probably unfluted in the inner four compact whorls; those in the next looser volutions are folded into rather regular folds in the lower more than  $2/3$ . In the last two whorls the antethecae are strongly fluted for the entire height and the compressed folds are arranged from pole to pole even as well in the apertural area. The polar parts are twisted to form fine anastomoses. Their number is yet unknown.

Buccal aperture well defined in the inner whorls but not clear in the outer ones. It is slit-like, low and narrow, being nearly  $1/20$  the length of the whorl.

Chomata are almost entirely absent, only leaving vestiges on the wall of the proloculum.

Axial fillings are developed as two rough cones only in the lateral regions of the middle whorls. The base of the cones faces the proloculum at some distance, leaving the most median part of the compact whorls and the median one third of the next three volutions free from these calcareous deposits. The polar portion of the three outermost whorls is also kept clear of the fillings.

Proloculum spheroidal, minute, having a diameter of only 0.09 mm.

Remarks: The present form differs from *Chusenella deprati* Ozawa in the greater size, the more whorls, the more intense folding of the antethecae and the curious shape of the test. Our species has two more whorls than Ozawa's form. The antethecae are strongly folded to form high and tight folds in the former species, but low and round folds are produced in the latter. Though the present form is now described as a distinct species, it still bears much affinity to *Chusenella deprati* Ozawa. This fact is principally warranted by the two clear stages of development of the whorls in the two forms. If in the future intermediate forms are obtained to prove that the present form is conspecific with the latter type, the present species may be lowered to the rank of a new variety of *Chusenella deprati* Ozawa.

Horizon and locality: It occurs in the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.

### *Chusenella douvillei* (Colani)

(Pl. III, figs. 2—5)

1924. *Fusulina douvillei* Colani: *Mém. Serv. géol. l'Indochine*, Vol. XI, Fasc. I, pp. 98, 99; Pl. X, fig. 25; Pl. XIII, figs. 2—26.
1935. *Pseudofusulina globularis* Gubler; *Les Fusulinidés du Permien de L'Indochine, Mémoires de la Société Géologique de France*, Nouvelle Série, Tome XI, Fasc. 4, Feuilles 36 a 57, pp. 87—89, Pl. figs. 1, 2, 7; Pl. 11, fig. 1.

Test robust, shortly fusiform, rather large; the median zone considerably inflated, the umbilical ends bluntly pointed. In a mature specimen of nine whorls the length is 7.07 mm, the width 3.18 mm, the proportion of the width to the length is nearly 1:1.8. The first three or four whorls are particularly tight, while the next ones evolute. The lateral parts of the volutions are not much expanded so that no difference in height of the chamber can be detected from pole to pole. The outer surface of the whorls is not smooth but adorned with rather deep antethecal grooves and local shallow depressions which resulted probably from the slenderness of the spirotheca. The number of whorls is 8—9.

Some results of measurement are given below:

	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.26	0.38	0.56	0.88	1.33	2.01	2.84	3.76	4782
Thickness of spirotheca (in mm)	0.023	0.026	0.029	0.041	0.050	0.050	0.059	0.047	4782

Spirotheca thin and increasing so slowly in thickness as the whorls coiling forward that the addition of thickness is almost unperceivable in the outer whorls. The thickness of the spirotheca is also maintained nearly constant toward the poles. The alveoli in the keriotheca are rather coarse and in some cases they are particularly loose. This is a peculiarity of this species.

Antethecae thin, not much fluted in the first two whorls so that the median space of the inner chambers is clear of any antethecal folds. Those in the next whorls are regularly and intensely folded into numerous high folds, the tops of which largely come within a short distance of the roof of the chambers. Except for a few with compressed sides the majority of the folds are rather broad. The umbilical parts of the antethecae in the outer whorls are highly twisted to form fine-meshed anastomoses. In median section the antethecae appear slender and flexuous; the contiguous pair often come in contact at their middle part. The numbers of the antethecae are respectively 10, 18, 20, 28, 28, 38, 37, and 51 in eight successive volutions.

The weak chomata appear to be developed in the first three volutions, but are entirely absent in the other ones.

Buccal aperture only seen in the first three whorls where it is slit-shaped, low and narrow; the angle of tunnel is  $39^\circ$ . In the next volutions the aperture is probably not well defined for the apertural area is even also occupied by the antethecal folds.

Axial fillings are poorly deposited as two small irregular bars each in one of the lateral regions, extending from the vicinity of the proloculum towards the poles but not reaching them and stopping short of the anastomoses.

Proloculum spheroidal, minute, 0.17 mm in diameter.

Remarks: This species was first described by Madam Colani in 1924 from Yunnan. According to her, this form is associated with *Schwagerina verneuili* Möller, which is however rather doubtful in specific identification. Our form is almost identical with Colani's species in all the essentials. Nevertheless, the spirotheca of our specimens is apparently thinner than that of the Yunnan form; it never exceeds 0.08 mm in the thickest part. In Yunnan specimen it was measured up to 0.09 mm by Colani in the seventh volution. The antethecal folds in our form seem more regular and intense than in Colani's sections which are indeed somewhat oblique to the axis of the test. The axial fillings are in long, narrow bars in the present form, but broader, shorter and more irregular in Colani's types. These slight differences are possibly still within the specific variations.

Horizon and locality: This species has a rather long vertical range of distribution in the Chinghsichung Limestone of Hunan Province. It also occurs in the Wuhsueh Limestone in the hills near Tienchiachun and in the Taochishan (刀脊山) at Kingshan (京山), Hupeh Province. In the first locality it appears in association with *Chusenella tingi* Chen, *Verbeeckina verbeecki* Geinitz and *Neoschwagerisia craticulifera* Schwager; in the second place its associated forms are *Chusenella deprati* Ozawa, *Schwagerina yüi* Chen and *Schwagerina longipertica* Chen; its association in the third locality is not clear.

### Genus *Paraschwagerina* Dunbar & Skinner, 1936

**Genotype** *Paraschwagerina gigantella* (White) = *Schwagerina gigantella* White, 1932

Test large, inflate-fusiform to subcylindrical; the first three to five volutions closely coiled, the outer whorls highly

inflated; spirotheca composed of tectum and keriotheca; septa strongly fluted throughout; aperture singular; chomata weakly developed only in the inner tight whorls or undeveloped; proloculum small.

Range. Permian of Asia, Europe and America.

***Paraschwagerina shengi* Chen sp. nov.**

(Pl. VI, figs. 1—4)

Test short-fusiform, large; the median zone considerably vaulted, the extremities rounded. Three stages of development are distinctly recognized. The first three volutions are compactly coiled; at the beginning of the fourth volution its height increases rather abruptly and the subsequent whorls keep loose up to the penultimate volution; in the last whorl the height slowly decreases again. The axial length of a specimen with  $6\frac{1}{2}$  whorls measures 7.69 mm, the median width is not known. In another specimen which has 8 whorls the median width is 4.23 mm. The number of whorls in the mature form is  $6\frac{1}{2}$  or  $8\frac{1}{2}$ .

Spirotheca thin and slender, gradually increasing in thickness toward the outer whorls, measuring 0.06 mm thick at the end of the eighth whorl. The keriotheca developed into a rather coarse alveolar structure.

Septa particularly thin and long. They are composed of the incurved part of tectum from spirotheca and a thin posterior layer of keriotheca advancing from the spiral wall. The fluting only affects the lower half of the septa in the median zone where wide and round folds are resulted, but the intensity increases as approaching the poles where large-meshed reticulations are produced. The numbers of septa are 12, 18, 18, 20, 22, 26, 28, and 43 respectively in the 1—8 volutions.

Chomata are not present.

Buccal aperture low and narrow, the actual shape having not been observed.

Proloculum generally spheroidal, sometimes kidney-shaped, with a diameter of 0.22—0.31 mm when spheroidal. Its wall is a little thicker than the spirotheca in the first three whorls.

The widths of the whorls and the thickness of the spirotheca are given in the following table:

	Whorls								Specimen
	I	II	III	IV	V	VI	VII	VIII	
Width (in mm)	0.32	0.43	0.56	0.83	1.41	2.19	3.12	3.91	1204
Thickness of spirotheca (in mm)	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.07	

Remarks: The megalospheric and microspheric generations are represented in our collection; the size of the proloculum varies in a small degree in the two generations; it measures 0.23 mm in diameter in the smaller proloculum, and 0.32 mm in the larger one.

Horizon and locality: This species is found in the gray massive beds of the Chingsichung limestone, Fengkuan-shan, Hsianghsiang County, Hunan Province. Some specimens belonging to this species have also been collected from the Wuhsueh limestone in the hills in the neighbourhood of Tienchiachun, Kwangchi County, Hupeh Province. It appears in association with *Verbeekina verbeeki* Geinitz, *Neoschwagerina margaritae* Deprat and *Neoschwagerina douvillei* Ozawa.

**Subfamily Verbeekinae Staff & Wedekind, 1910**

The subfamily Verbeekinae comprises the advanced forms. The tests are cylindrical or subspherical. The spirotheca is composed of tectum, fine keriotheca and inner tectorium, but the latter is lost in the more specialized genus. The

septa are unflated. The median tunnel is present only in the primitive forms but absent in the advanced ones. Foramina are numerous, in a row along the basal part of the septa. The parachomata are present. The proloculum is small in general.

This subfamily is known only from the Permian of the Tethys Sea area and western America.

### Genus *Verbeekina* Staff, 1909

**Genotype** *Verbeekina verbeeki* (Geinitz) = *Fusulina verbeeki* Geinitz, 1876.

Test short, fusiform and subspheroidal, consisting of numerous volutions; wall composed of tectum and keriotheca the latter of which is underlined by a dense layer; septa unfluted; parachomata usually broken, well developed in the endothyroid juvenarium, lacking or rudimentary in the middle whorls and reappearing in the outer volutions; basal foramina abundant; proloculum minute.

Range: Permian of the Eastern Hemisphere.

### *Verbeekina verbeeki* Geinitz

(Pl. IX, figs 5, 6, Pl. XIII, figs. 1, 2)

1875. *Fusulina princeps*, Brady: *Geol. Mag.* p. 532, Pl. XII, figs. b, c.  
 1876. *Fusulina verbeeki*, Geinitz: *Palaeontographica*, Vol. XII, p. 399.  
 1879. *Schwagerina princeps* (Ehrenh.), Möller: Die Foraminiferen des russischen Kohlenkalks, *St. Petersburg, Mem. Ac. Imp.*, Vol. XXVII, No. 5, p. 7.  
 1888. *Schwagerina verbeeki*, Schwager: *China*, Vol. IV, p. 135, pl. XVI, figs. 17—18; pl. XVII, figs. 9—17.  
 1898. *Möller verbeeki*, Schellwien: *Palaeontographica*, Vol. 44, p. 258.  
 1909. *Verbeekina verbeeki*, H. von Staff: Beiträge zur Kenntniss der Fusuliniden, *Neues Jahrb. f. Min.* Vol. XXVII, p. 476, Pl. VII.  
 1912. *Schwagerina verbeeki*, Deprat: *Mém. serv. géol. l'Indochine*, Vol. I, Fasc. 3, p. 40, Pl. I, figs. 7—11.  
 1913. *Schwagerina (Verbeekina) verbeeki*, Deprat: ditto. Vol. II, Fasc. 1, p. 47.  
 1924. *Schwagerina verbeeki*, Colani: ditto. Vol. XI, Fasc. I, pp. 108—111, Pl. XV, fig. 14; Pl. XVIII, figs. 2, 5, 16—21, 25—27; Pl. XIX, figs. 1—7, 10, 11, 13.  
 1925. *Verbeekina verbeeki*, Ozawa: *Journ. Coll. Scien.* Vol. XIV, Art. 6, pp. 48—51, Pl. X, figs. 6, 7.  
 1934. *Verbeekina verbeeki*, Chen: Fusulinidae of South China, Part. I, *Palaeontologia Sinica*, Ser. B, Vol. IV, Fasc. 2, pp. 101, 102, Pl. XVI, fig. 1.

There are two different classes of forms of this species in ancient Chinese seas: one with a slightly but distinctly compressed test and the other a more globular test which has an axis of convolution somewhat greater than the median diameter. In the former case, the early compact whorls are considerably compressed, the spirotheca is generally thin and whorls have a greater height. On the other hand, the globular form has all the whorls globular and more compact. The two extreme forms are connected by some intermediate forms which built globular test and compressed early whorls. The spirotheca is always composed of three layers, namely, tectum, firm keriotheca and inner tectorium. It has a thickness of 0.05 mm in the outer whorls. The septa thin in the inner whorls, becoming fairly thick in the outermost coils. Parachomata only developed in the early compact and the last several volutions, probably obsolete in the many middle-whorls. Apertures minute, subcircular. Proloculum excessively minute, spherical or spheroidal, about 0.048 mm in diameter. The tests of this species are generally large; the axial length attains to 10.95 mm and the median width 8.67 mm.

The measurements of the width of the whorls from the compressed form are given below (in mm):

## Compressed form (5553)

I	0.20
II	0.34
III	0.53
IV	0.94
V	1.50
VI	2.22
VII	3.02
VIII	3.82
IX	4.85
X	5.83
XI	6.75
XII	7.44

Horizon and locality: This form is widely distributed in South China. Where the Maok'ou Limestone and its equivalent occur, this species is easily found out.

***Verbeekina verbeeki sphaera* Ozawa**

(Pl. IX, figs. 11, 12)

1927. *Verbeekina verbeeki sphaera*, Ozawa: *Journ. Fasc. Scien.* Vol. II, part 3, p. 153; Pl. XXXVII, fig. 6g; Pl. XXXVIII, figs. 14, 15, 16a; Pl. XL, fig. 11b; Pl. XLIV, fig. 6b.

Test small, globular, with an axial length of 2.48 mm and median width of 2.16 mm in a specimen which has seven or eight whorls. The manner of coiling of the first few whorls is still unknown, but probably they are tightly wound as in the type species. The last volutions are moderately close and so slowly expanding that the rate of expansion is almost imperceptible in two adjacent whorls.

Spirotheca thin, consisting of tectum and fine keriotheca, of which the inner surface is lined with a very thin layer which may represent the inner tectorium. The spirotheca increases very slowly in thickness, measuring only 0.034 mm thick in the penultimate whorl. The thickness of the last part of the spirotheca much decreases again, indicating the presence of an gerontic stage.

Septa thin and plane. On account of lack of median section the detailed condition regarding the septa cannot be definitely determined.

Parachomata in low and broad spirals which seem to be irregularly and brokenly developed; they appear in the early and last whorls but disappear in the middle ones.

Apertures minute and subcircular.

Shape and size of the proloculum are unknown.

Remarks: The present form is quite comparable in the small globular test, the tight whorls and the irregular parachomata with the Ozawa's variety. It distinguishes from the young form of *Verbeekina crassispira* (sp. nov.) by the thin spirotheca and the irregular and early-developed parachomata, though sometimes the two forms are really very similar.

Unfortunately only two slightly para-axial sections have been obtained in our collection, and Ozawa did not give excellent figures and a detailed description of his variety, so that the status of this variety cannot be decidedly established.

Horizon and locality: This variety is found in association with *Cancellina schellwieni* Deprat in the Maok'ou Limestone at Shangchin (上金) and Lingyün (凌雲), Kwangsi Province.

***Verbeekina ellipsoidalis* Chen sp. nov.**

(Pl. IX, figs. 1—4)

1914. *Verbeekina verbeeki*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. III, Fasc. I, pp. 19, 20; Pl. IV, figs. 5—7.

Test ellipsoidal with a gently vaulted median zone and rounded poles. The axial length and the median width of a para-axial section which is cut close to the proloculum are 6.24 mm and 4.77 mm respectively. The first three whorls exceedingly close, while the others loose. The number of whorls is 13 or a few more.

Spirotheca is constructed entirely according to the type of the common form *Verbeekina verbeeki* Geinitz. Its thickness increases steadily towards the outermost whorl, measuring 0.061 mm there.

Septa are almost plane short and comparatively thick, consisting of a middle layer of the inflected part of the spirothecal tectum and the anterior and posterior layers of keriotheca in the early close whorls; they become thin and are composed seemingly of a single layer of tectum in the last whorls.

Parachomata very rarely developed or entirely absent in the inner whorls, and those built in the outermost volutions are widely-spaced and varying in breadth and height.

Apertures seem to vary in form, sometimes subrectangular, and sometimes subcircular.

Proloculum is excessively minute.

Remarks: In 1914, Deprat described some forms from Akasaka, Japan, under *Verbeekina verbeeki* Geinitz. The figure of the para-axial section distinctly represents an ellipsoidal form which is quite different from Geinitz's species principally in the ellipsoidal test and the rudimentary parachomata. I now propose the present name to cover the ellipsoidal forms.

Horizon and locality: This is a profuse species, and represented by plenty of individuals together with *Verbeekina verbeeki* Geinitz and *Cancellina schellwieni* Deprat in the Maok'ou Limestone, Shangchin, Kwangsi Province.

***Verbeekina crassispira* Chen sp. nov.**

(Pl. IX, figs. 7—10)

Test globular with an axial length slightly greater than the median width. The former measures 5.87 mm and the latter 5.38 mm from a specimen which has 13 whorls. The inner three or four volutions are more compact, the next ones comparatively loose; the height of the last whorl visibly decreases again. All the whorls are closer than in the case of *Verbeekina verbeeki* Geinitz. The number of whorls in the mature forms is usually 13 or a few more.

Results of several measurements are as follows:

Whorl	Width of whorls (in mm)	Thickness of spirotheca (in mm)
I	0.17	
II	0.29	
III	0.46	0.027
IV	0.65	0.032
V	0.91	0.041
VI	1.29	0.043
VII	1.79	0.045
VIII	2.41	0.054
IX	2.98	0.068
X	3.60	0.068
XI	4.19	0.061
XII	4.79	0.061
XIII	5.38	0.082

Spirotheca rather thick, consisting of tectum, keriotheca and inner tectorium the last of which is comparable with the tectum in thickness. The alveolar structure of the keriotheca is exceedingly fine.

Septa unfluted, very thin in the inner whorls, seeming to be made up of a mere layer of the incurved part of the spirothecal tectum; those in the outermost whorls are short and thick, and composed of three layers, the middle layer of the inflected tectum and the anterior and posterior layers of keriotheca which come down to the very edge of the septa. The lower portion of the septa is moderately consolidated.

Apertures multiple, and elliptical.

Parachomata developed in the early compact whorls, obliterated in the middle volutions, and recurred in the outer whorls where they are represented by small round or subangular ridges which are much weaker and more irregular than those in the case of *Verbeeķina verbeeķi* Geinitz.

Proloculum is unknown in size and shape, but it is certain that the size is very small, difficult for preparation.

Remarks: This species is erected on the fact that the spirotheca is significantly thick. The spheroidal test and the weak parachomata are also the important features reliable to distinguish it from the well-known species *Verbeeķina verbeeķi* Geinitz.

Horizon and locality: It occurs in association with *Cancellina schellwieni* Deprat in the Maok'ou Limestone at Putuntsun (晡統村), Kiangmen (江明), Kwangsi Province.

### Genus *Misellina* Schenck & Thompson, 1940

**Genotype** *Misellina lepida* (Schwager) = *Schwagerina lepida* Schwager

Test ellipsoidal to melon-shaped; wall rather thin, consisting of tectum and finely alveolar keriotheca; septa plane; basal foramina abundant; parachomata well developed throughout all stages of development; proloculum minute.

Range: Permian of the Eastern Hemisphere.

#### *Misellina lepida* (Schwager)

(Pl. VI, figs. 5—8)

1883. *Schwagerina lepida* Schwager: *China*, Vol. IV, pp. 138—140, Pl. XVII, figs. 1, 3, 4, 6.

1898: *Möllerina lepida*, Schellwien: *Palaeontographica*, Vol. 44, p. 258.

1912. *Doliolina lepida*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. I, Fasc. III, p. 45, 46, Pl. V, figs. 10; Pl. VI, figs. 1—3.

Test large, short, cylindrical. Axial length ranges from 5.77 to 6.42 mm, and median width from 3.81 to 4.85 mm; the axial ratio varies from 1:1.3 to 1:1.5. In one specimen which has eighteen whorls the median width attains to 5.00 mm. The first one or two whorls usually endothyal; the next four or five more or less ellipsoidal; the other volutions gradually becoming cylindrical. All the whorls are compactly coiled and steadily expanded outward. The number of whorls is 14—18.

The widths of the whorls are given below (in mm):

	Hunan form (1172)	Hupei form (5162)
Proloculum	0.04	0.11
I	0.15	0.17
II	0.23	0.28
III	0.31	0.38
IV	0.42	0.50
V	0.54	0.68
VI	0.71	0.91



VII	0.87	1.22
VIII	1.07	1.62
IX	1.46	2.08
X	1.62	2.57
XI	1.97	3.10
XII	2.36	3.67
XIII	2.81	4.23
XIV	3.28	4.85
XV	3.81	

Spirotheca thin, composed of tectum and keriotheca; the alveolar structure is exceedingly fine. The inner surface of the keriotheca is usually lined by a dark, thin and uniform layer which sometimes is not weaker than the tectum. The last part of the spirotheca generally thins off when the test has reached the gerontic stage.

Septa short, stout, constructed by the incurved part of the spirotheca and strengthened on both sides with keriotheca. The lower ends are usually enlarged and darkened.

Parachomata well developed, mostly in rectangular and partly in angular ridges.

Aperture multiple, minute, subcircular.

Proloculum minute, spheroidal or spherical, with a diameter of 0.04—0.11 mm.

Horizon and locality. This species is abundantly developed in the Chinghsichung Limestone in Hunan and the Wuhsueh Limestone in Hupeh. It has been known in association with *Chusenella douvillei* Colani from Hungshantien and Chinghsichung in Hsianghsiang county Hunan. In Hupeh this form is obtained from the upper part of the Wuhsueh Limestone in the hills near Tienchiachun in Kwangchi county.

### ***Misellina major* Deprat**

(Pl. VI, figs. 9—11)

1883. *Schwagerina lepida*, Schwager: *China*, Vol. IV. Pl. XVIII, figs. 2, 5, 7, 8.

1913. *Doliolina lepida*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. II, Fasc. I, p. 49, Pl. X, fig. 18.

1914. *Doliolina major*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. III, Fasc. I, pp. 23, 24; Pl. III, figs. 15—17.

Test large, ellipsoidal, with the median zone evenly vaulted and the poles rounded. The largest test in our collection measures 8.34 mm long and 5.53 mm broad; the axial ratio is 1:1.5. Whorls regularly and closely coiled, numbering more than 14.

On account of no strictly axial section having been prepared, measurement of the width of the successive whorls can by no means be made.

Spirotheca thin, consisting of three distinct layers; the tectum, the fine keriotheca and the inner tectorium, which, in strength, is almost comparable to the tectum. The spirotheca measures 0.027-0.041 mm thick in the outermost whorls.

Septa comparatively thin, composed of the three general layers of the *lepida*-type. Their lower portion is usually consolidated and inflated. There are about 35 septa in the last whorl.

Apertures multiple, subcircular.

Parachomata well developed, running as fine rectangular ridges with a height 2/3 that of the chambers in the inner whorls; but in the outer volutions their strength gradually drops and the shape changes into angular spirals.

Axial fillings completely absent.

Proloculum is unknown both in shape and size.

Remarks: This species differs from *Misellina lepida* Schwager chiefly in the ellipsoidal shape of the test; but other

features are almost similar in these two species. The present form resembles the *ellipsoidal* type of Schwager's *Doliolina lepida* and Deprat's *Doliolina major*. These forms may be essentially identical. However, a slight difference still exists between them in that the early portions of the parachomata in our form seem to be rather broad and the last parts thin and low, while in Schwager's and Deprat's forms they almost maintain the same strength throughout all the whorls.

*Misellina claudiae* Deprat of the Chihhsia Limestone, although also with an ellipsoidal test, is easily distinguished from the present form in the much smaller size and the exceptionally strong parachomata.

Horizon and locality: It occurs in no association with any other Fusulines in certain beds in the upper part of the Chihhsichung Limestone at Hungshantien, Hsianghsiang county, Hunan Province.

### *Misellina compacta* Chen sp. nov.

(Pl. IV, figs. 9—11)

Test small, cylindrical. The axial length and the median width of the mature test are not yet definitely known. The length and the width of a para-axial section with  $11\frac{1}{2}$  whorls are 4.82 mm and 2.33 mm respectively. The ratio between the latter and the former is 1:2.1. All the whorls are cylindrical and closely and regularly coiled. The number of whorls is 12 or more.

Some results of measurement are given below:

	Whorls									Specimen
	I	II	III	IV	V	VI	VII	VIII	IX	
Width (in mm)	0.30	0.42	0.53	0.64	0.78	0.96	1.17			5483
	0.17	0.26	0.35	0.46	0.63	0.70	1.08	1.34	1.63	4572
	0.30	0.39	0.49	0.59	0.74	0.91	1.09	1.31		4574

Spirotheca thin, thickening slowly while coiling forward, composed of tectum and fine keriotheca. The strength of the spirotheca persisting for a long distance in the axial direction. It measures 0.03 mm thick in the thickest part of the outer whorls.

Septa short and thick, consisting of three layers, namely, the middle layer of the incurved part of the spirothecal tectum and the anterior and posterior layers of keriotheca. In an improperly cut median section they number 6, 9, 15, 17, 18, 14, and 17 respectively in seven successive whorls.

Apertures multiple, minute, subcircular, widely separated by the broad parachomata.

Parachomata broad and low, generally running from the first whorl to the last as sub-angular ridges. Their height seems not to exceed half that of the chamber.

Proloculum spheroidal, small, 0.13—0.20 mm in diameter.

Remarks: This species differs from *Misellina lepida* Schwager in the markedly smaller test, the more compact whorls, the broad and low parachomata and the larger proloculum.

Horizon and locality: It occurs in association with *Misellina lepida* Schwager and *Chusenella douvillei* Colani in the Wuhsueh Limestone in the hills near Tienchiachun, Kwangchi county, Hupeh. Province.

### Genus *Pseudodoliolina* Yabe & Hanzawa, 1932

#### Genotype *Pseudodoliolina ozawai* Yabe & Hanzawa, 1932

Test of medium size, ellipsoidal or cylindrical; whorls closely coiled; proloculum large; spirotheca composed of a single layer of tectum, but sometimes a thin layer of keriotheca is discernible in the outermost volutions; parachomata

high and complete, but not uniform in height; foramina are numerous.

Range. Permian of Asia.

### *Pseudodoliolina ozawai* Yabe & Hanzawa

(Pl. IV, figs. 12—14)

1914. *Doliolina lepida*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. III, Fasc. I, p. 22, Pl. III, figs. 12—14.  
 1927. *Doliolina lepida*, Ozawa: *Journ. Fasc. Scien. Imp. Univ. Tokyo*, sec. II, Vol. II, Part 3, Pl. XLV, figs. 1, 2.  
 1932. *Pseudodoliolina ozawai*, Yabe et Hanzawa: *Proc. Imp. Acad. Japan*, Vol. 8, p. 41.  
 1934. *Pseudodoliolina ozawai*, Chen: *Palaeontologia Sinica*, Ser. B, Vol. IV, Fasc. 2, Pt. I, pp. 100, 101, Pl. XVI, figs. 3, 4.

Test Cylindrical with the ends roundly terminated. The axial length and the median width 5.12 and 2.10 mm respectively measured from a Kwangsi specimen with twelve whorls. The proportion of the latter to the former is about 1:2.4. Whorls closely coiled and all subcylindrical possibly except the first one. The lateral parts of the outer whorls in the typical forms are not much extended, and the height of the whorls increases very slowly toward the old stage of growth. Convolution numerous, usually 12, sometimes attaining to 14 in number. There are two generations detected in our material: the microspheric form developing a longer test, with more and compact whorls, and the macrospheric form having a shorter test, with less and looser volutions.

Two measurements from the two types are as follows:

	Microspheric form (in mm)	Macrospheric form (in mm)
Proloculum	0.14	0.22 (0.27)
I	0.20	0.34
II	0.28	0.44
III	0.37	0.55
IV	0.47	0.68
V	0.62	0.85
VI	0.78	1.08
VII	0.91	1.30
VIII	1.12	1.55
IX	1.35	1.77
X	1.61	
XI	1.92	

Spirotheca exceedingly thin and slender, composed of only one layer of the thick tectum, the keriotheca being entirely wanting. It measures about 0.01 mm thick in the outer whorls in some cases, but usually a little thinner.

Septa as thin as the spirotheca and frequently appearing in irregular curved thick lines in the median section of the test; this is evidently due to its flexibility. They are rather distantly spaced in the last volutions. The septal numbers are roughly 6, 9, 11, 12, 13, 15, 19, 19, 25, 26, and 28 in the successive whorls respectively.

Apertures multiple, minute, subcircular.

Parachomata well developed, high, reaching about 2/3 or a little more the vertical distance between the two adjacent spiral walls. They are generally disposed with an intervening space more than once or twice their own thickness.

Proloculum generally spheroidal, having two sizes representing the two alternative generations. In the micro-

spheric form the proloculum is minute, not more than 0.14 mm in diameter; the macrospheric proloculum is an irregular spheroid with a short diameter of 0.22 mm and a long diameter of 0.27 mm.

Horizon and locality: This species is abundant in the lower beds of the Chingsichung Limestone, Hutien, Hsianghsiang county, Hunan Province. It is also very rich in a certain horizon of the Maok'ou Limestone, Lukow, Hochien, Kwangsi Province. As I am aware, it is associated only with an indeterminate species of *Schwagerina* at the first locality. In the second place it occurs probably alone.

### Subfamily Neoschwagerininae Dunbar & Condra, 1928

This subfamily comprises the most advanced fusulinids. The test is mostly large thickly fusiform, subcylindrical or subglobular. Spirotheca is composed of tectum and fine keriotheca. Septa are unfluted. The axial and transverse septula are well developed. Median tunnel is wanting. Parachomata and foramina are present. Proloculum is small or large.

This subfamily is abundantly developed in Asia and Europe, but rarely found in America.

### Genus *Cancellina* Hayden, 1909

**Genotype, *Cancellina primigenia* (Hayden) = *Neoschwagerina primigenia* Hayden, 1909**

Test is small and inflatedly fusiform, the median part inflated and the poles pointed; spirotheca is composed of tectum and fine keriotheca; septa are closely spaced and slightly arcuate; parachomata are narrow and high, and join the lower ends of the transverse septula; transverse septula occur in the outer whorls and are not regular in thickness; foramina are small and numerous; proloculum is small.

Range: Permian of Asia.

### *Cancellina schellwieni* Deprat

(Pl. XII, figs. 1—3)

1913. *Doliolina schellwieni*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. II, Fasc. I, pp. 51, 52, Pl. VIII, figs. 4—9.  
 1922. *Yabeina minima*, Ozawa: Preliminary Notes on the Classification of the Family of Fusulinidae, Pl. IV, fig. 3.  
 1925. *Neoschwagerina parva*, Colani: *Mém. Serv. géol. l'Indochine*, Vol. XI, Fasc. I, p. 120, Pl. XX, fig. 12; Pl. XXI, figs. 9, 14, 15.  
 1925. *Yabeina schellwieni*, Ozawa: *Journ. Coll. Scien.* Vol. XLV, Art. 6, pp. 60—61, Pl. X, figs. 3a, 4.  
 1927. *Cancellina schellwieni*, Ozawa: *Journ. Fasc. Scien.* Vol. II, Part 3, p. 161, Pl. XXXIV, fig. 13; Pl. XLIV, fig. 1b; Pl. XLV, fig. 3.  
 1934. *Cancellina schellwieni*, Chen: Fusulinidae of South China, Part I, *Palaeontologia Sinica*, Ser. B, Vol. IV, Fasc. 2, pp. Pl. XVI, figs. 5—12.

Test moderate-sized, fusiform, regularly vaulted at the median part, rounded at the ends. Whorls closely coiled, 7 in number. The dimensions of the mature form are yet unknown but the length and the width of the sixth whorl are 2.29 and 1.16 mm respectively and the axial ratio of this volution is 1:1.9.

The widths of the whorls are as follows (in mm):

I	0.42
II	0.54
III	0.72
IV	0.91
V	1.16
VI	1.43
VII	1.71

*Spirotheca* thin, varying in thickness; the tectum seems to be rather thick; the keriotheca is poor in development to such an extent that its real presence is sometimes difficult to ascertain.

Spiral primary septula appear irregular in cross section, oppose the parachomata and frequently unite together with them.

Spiral secondary septula short and very rarely developed in the last whorls, one appearing in the interspace between the primaries.

Axial septa thin, their lower ends usually pointing forward.

Axial septula developed rather early, usually one, and rarely two, intercalated between a pair of the septa.

Apertures have not been clearly observed but are probably minute and subcircular.

Proloculum spheroidal, large, thin-walled, with a diameter varying between 0.19 and 0.30 mm. In a very rare case its size may attain to 0.35 mm.

Horizon and locality: This form occurs in moderate abundance in association with *Verbeekina verbeeki* Geinitz *Neoschwagerina simplex* Ozawa in the Maok'ou Limestone, Panliyü, Chungshen, Kwangsi Province. It is also found together with *Verbeekina verbeeki* Geinitz and its variety *sphaera* Ozawa, and *Verbeekina ellipsoidalis* (sp. nov.) in the same limestone at Shengchin of the same province.

### Genus *Neoschwagerina* Yabe, 1903

**Genotype** *Neoschwagerina craticulifera* (Schwager) = *Schwagerina craticulifera* Schwager, 1883

Test fusiform or globular; whorls close, numerous; spirotheca consisting of tectum and keriotheca throughout, without tectoria; axial septa unfluted, composed of a middle layer of tectum and two lateral layers of keriotheca; one to three axial septula extending downward from the keriotheca between a pair of septa; transverse septula extending downward from the keriotheca to meet the parachomata; aperture in a series of small rounded pores; parachomata in fine spirals; proloculum generally minute, rarely large.

Range: Permian of the Eastern Hemisphere.

### *Neoschwagerina simplex* Ozawa

(Pl. XII, figs. 13—16)

1927. *Neoschwagerina simplex*, Ozawa: *Journ. Fesc. Scien.* Vol. II, Part III, pp. 153—154; Pl. XXXIV, figs. 7—11, 22, 23; Pl. XXXVII, figs. 3. 6a.

Test middle-sized, fusiform, with a fairly vaulted median zone and bluntly pointed ends. In a typical form with ten whorls the axial length is 4.64 mm, the median width 2.96 mm, the form ratio 1:1.6. Another form which built ten and a half closer whorls has an axial length of 4.73 mm, a median width of 2.39 mm, and a form ratio of 1:2. Whorls are regular and close; the first two volutions more globular, while the others fusiform. The number of whorls is usually 11.

Two measurements of the whorl-width are given below (in mm):

Proloculum	0.15	0.17
I	0.31	0.28
II	0.44	0.41
III	0.60	0.53
IV	0.82	0.73
V	1.11	0.96
VI	1.45	1.19
VII	1.82	1.48
VIII	2.22	1.70
IX	2.60	1.96
X	2.96	2.39
	(5623)	(5304)

Spirotheca thick, consisting of thin tectum and thick keriotheca; the aggregate thickness measuring 0.04 mm in the tenth whorl.

Axial septa rather thick, made up of the middle layer of the incurved part of the spirothecal tectum and the anterior and posterior layers of the keriotheca; the lower part usually opaquely consolidated.

Axial septula first appear in the fourth whorl, always alternating with the septa.

The primary transverse septula thick and short, extending from the keriotheca to meet the parachomata.

The secondary transverse septula not developed.

Apertures minute, circular.

Parachomata coarse and high, usually attaining to 1/2 the chamber-height.

Proloculum spheroidal, small, 0.15—0.17 mm in diameter.

Remarks: Our form is quite comparable with the Japanese specimen first described by Y. Ozawa from Akasaka Limestone in all the essential features. The width of the whorls, the thickness of the spirotheca and the size of the proloculum are almost perfectly identical with those in Ozawa's form. The only point of difference is in the axial ratio. Perhaps Ozawa made the measurement not on the strictly axial sections of the tests. This fact is evidently proven by the illustrations of the oblique sections given by Ozawa in his paper. The true outer shape of the tests of this species is short-fusiform but not globular as Ozawa stated.

This species differs from *Neoschwagerina craticulifera* Schwager chiefly in the more thickness of the spirotheca. The high parachomata and the short test are also points of difference reliable to separate this species from the latter.

Horizon and Locality: Associated with *Verbeeķina verbeeķi* Geinitz and *Cancellina schellwieni* Deprat in the Maok'ou limestone, Chungshan and Shengchin, Kwangsi Province.

### ***Neoschwagerina craticulifera* Schwager**

(Pl. XII, figs. 10—12)

1883. *Schwagerina craticulifera*, Schwager: *China*, Vol. IV, p. 140, Pl. XVIII, figs. 15—25.
1898. *Möllerina craticulifera* (Schwager), Schellwien: *Palaeontographica*, Vol. 44, p. 258.
1903. *Doliolina craticulifera*, Schellwien: *Palaeozoische und Triadische Fossilien aus Ostasien in Futterer's Durch Asien*, Vol. III, pp. 125—174, Pl. V, fig. 5.
1906. *Neoschwagerina craticulifera* (Schwager), Yabe: *Journ. Coll. Scien.* Vol. XXI, Art 5, p. 3, Pl. I, fig. 3.
1909. *Neoschwagerina craticulifera*, Hayden: Fusulinidae from Afghamistan, *Record Geol. Surv. India*, Vol. XXXVIII, Part 3, pp. 248—249, Pl. XXI, figs. 1—7.
1912. *Neoschwagerina craticulifera*, Deprat: *Mém. Serv. Géol. l'Indochine*, Vol. I, Fasc. III, pp. 47—49, Pl. II, figs. 1, 2, 4.
1914. *Neoschwagerina craticulifera* var. *Rotunda*, Depart: Ditto. p. 26, Pl. VIII, figs. 6—13.
1922. *Neoschwagerina craticulifera* var. *sphaeroidea*, Ozawa: *Journ. Geol. Soc. Tokyo*, Vol. XXIX, Pl. fig.
1927. *Neoschwagerina craticulifera*, Ozawa: *Journ. Fasc. Scien.* Vol. II, Part III, pp. 154—156, Pl. XL, figs. 1—3, 4—8, 10, 11a.

There are two forms of this species in our material. The macrospheric generation is represented by a great number of specimens while the microspheric form only by one test. The tests of the two generations are fusiform with the median zone considerably vaulted and the poles short and pointed. In the macrospheric type the ends usually slightly bend to one side so that the lateral zones on this side are gently depressed. The axial length is 5.38—6.38 mm and the median width 3.25—3.50 mm; the axial ratio is 1:1.7 or 1:1.8. The whorls compact and regular. The bending of the ends starts early in the seventh whorl, becoming more pronounced in the outer ones. The test of this generation has 13 or 14 whorls. The microspheric form built also 14 whorls; the first three or four volutions are excessively tight while

the next convolutions coil in the same manner as the other type. The two dimensions of the microspheric test are hence smaller; the length measures only 4.29 mm and the median width 2.44 mm, but the axial ratio maintains the same relation.

Two measurements, one from the macrospheric form and the other from the microspheric are given below:

Whorl	Macrospheric form (in mm)	Microspheric form (in mm)
I	0.26	0.08
II	0.35	0.14
III	0.49	0.20
IV	0.64	0.29
V	0.79	0.43
VI	0.99	0.57
VII	1.19	0.74
VIII	1.43	0.94
IX	1.65	1.18
X	1.92	1.42
XI	2.24	1.68
XII	2.56	1.91
XIII	2.90	2.17
XIV	3.25	2.44

Spirotheca thin, increasing a bit in thickness spirally and keeping constant strength axially. It is usually slightly thicker in the macrospheric form, measuring 0.027 mm in the tenth volution, while only 0.02 mm in the same whorl of the microspheric test. The alveolar structure of the keriotheca is very fine. The tectum is relatively thick, estimated at above 1/4 the whole thickness of the spirotheca in the outer whorls.

Axial septa short, thick and crowded in the early whorls but long, thin and widely apart in the next ones. They are composed of three layers: the middle lamina of the inbending part of the tectum of the spirotheca and the two lateral laminae of the keriotheca. The lower ends of them are always solidified, darkened, and bending forward, but the large upper portion is generally set at right angles to the spiral wall.

Axial septula make first appearance in the fifth volution, one intercalated between each pair of the septa. In the last whorls two or three grow in the septal interspace. They are the downward elongations of the keriotheca and as a rule, short and variable in shape.

Spiral septula well developed, pendant from the ceiling of the chamber for some vertical distance and mostly united together with the just opposite parachomata to form regular thin pillars. They measure 0.041 mm thick in the outermost whorls. No secondary septula are observable between the primary ones except some scattered short growths.

Aperture multiple, depressed circular and small in the inner whorls, becoming larger in the outer ones. Its vertical diameter measures about 0.02 mm in the seventh volution and 0.04 mm in the twelfth whorl.

The lateral openings of passage are minute and subcircular, occur in the vicinity of the axial septa and are raised to some elevation above the floor.

Parachomata small but well developed in semicircular ridges.

Proloculum minute, spheroidal with a diameter of 0.13—0.20 mm in the macrospheric specimens and only 0.04—0.08 mm in the microspheric type.

Horizon and locality: It associated with *Sumatrana annae* Volz in the Chinghsichung Limestone, Hutien, Hsiang-hsiang, Hunan Province. A microspheric form of this species has been found in the Wuhsueh Limestone in the hills near Tienchiachun, Kwangchi County, southeastern Hupeh.



***Neoschwagerina douvillei* Ozawa**

(Pl. XIII, figs. 3—7; Pl. XIV, fig. 7)

1906. *Neoschwagerina globosa*, Douville: *Bull. Soc. géol. France, Ser. IV, Vol. VI, Pl. XVII—XVIII.*  
 1912, 13. *Neoschwagerina globosa*, Deprat: *Mém. Serv. géol. l'Indochine, Vol. I, Fasc. III, p. 51, Pl. IV, figs. 1—4; Vol. II, Fasc. I, p. 55.*  
 1914. *Neoschwagerina globosa*, Deprat: *Mém. Serv. géol. l'Indochine, Vol. III, Fasc. I, pp. 29—30.*  
 1924. *Neoschwagerina globosa*, Colani: *Mém. Serv. géol. l'Indochine, Vol. XI, Fasc. I, pp. 118—120, Pl. XXIII, figs. 1, 2, 4—14, 22—24, 36—38; Pl. XXV, figs. 9, 13, figs. a—c; Pl. XXVI, figs. 3, 5.*  
 1925. *Neoschwagerina douvillei*, Ozawa: *Journ. Coll. Scien. Vol. XLV, Art. 6, pp. 55—57.*

Test fusiform, gently vaulted in the median zone, pointed at the poles. The axial length is 5.98 mm, the median width 3.28 mm, and the axial ratio 1:1.8 in a typical specimen with  $15\frac{1}{2}$  whorls which possibly represent the maximum number. The first three or four volutions are globular and the rest fusiform.

Whorl	Width (mm)	
I	0.38	0.47
II	0.52	0.59
III	0.67	0.72
IV	0.82	0.86
V	1.02	1.02
VI	1.24	1.19
VII	1.42	1.39
VIII	1.62	1.59
IX	1.83	1.82
X	2.05	2.01
XI	2.29	2.20
XII	2.48	2.41
XIII	2.69	2.61
XIV	2.95	2.84
XV	3.25	3.10
Specimen	5219	5221

Spirotheca particularly thin, consisting of tectum and keriotheca; it measures only 0.09 mm thick in the twelfth volution.

Axial septa thin and slender, composed of three principal layers with the lower dark and solidified part pointing forward.

Axial septula short, pendent downwards to the halfway of the chamber height, making first appearance very early in the latter part of the first whorl, one alternating with the septa. In the second volution, two septula intercalate between each pair of the septa. They increase in number to three or four in the last whorls.

Primary Spiral septula thin, with almost parallel sides, opposing and connecting with the parachomata.

Secondary spiral septula entirely absent in a great number of inner whorls, but occasionally represented by some short matter in the interspace between the primary septula in the outermost whorls.

Aperture numerous, minute, depressed-subcircular.

Parachomata not very well developed into low ridges.

Proloculum spheroidal or spherical, thin-walled, moderately large with a diameter of 0.31—0.35 mm.

Remarks: This species is easily recognized by the big proloculum. By means of this feature and the thinner spirotheca, septa and septula, the present form is distinguished from *Neoschwagerina craticulifera* Schwager to which

the construction of whorls bears some resemblance. The forms which built a larger proloculum and may represent the megalospheric generation sometimes offer some difficulty in separation from the possibly microspheric forms of *Neoschwagerina megalospherica* Deprat. But they can be discriminated by the fact that *Neoschwagerina megalospherica* has a more vaulted median zone, distinct lateral constrictions in its vicinity and more compact whorls, while the median zone of *Neoschwagerina douvillei* Ozawa is gently vaulted and its whorls are evenly fusiform.

Horizon and locality: It occurs in profusion in the Maok'ou Limestone in the neighbourhood of the city of Chenkiang, Kwangsi Province, where it associates with *Chusenella douvillei* Colani, *Neoschwagerina megalospherica* Deprat and *Sumatrina annae* Volz. Some young forms of this species have also been found in association with *Chusenella douvillei* Colani and *Verbeekina verbeeki* Geinitz in the Chinghsichung Limestone at Fengkuanshan, Hsianghsiang County, Hunan Province.

### *Neoschwagerina colaniae* Ozawa

(Pl. XIV, figs. 1—4)

1927. *Neoschwagerina colaniae* Ozawa: *Journ. Fasc. Scien.* Vol. II, Part 3, pp. 157, 158, Pl. XL, figs. 9, 12, 13; Pl. XLI, figs. 3, 11.

Test moderate in size, rather globular. The axial length and the median width measured from a slightly oblique section with thirteen whorls are respectively 3.25 mm and 2.54 mm; the axial ratio derived from the above two figures is nearly 1:1.3. All the whorls are closely and regularly coiled; there is no change in the chamber height along the direction of the axis. The whorls number 13.

The widths of the whorls are given below (in mm):

I	0.12
II	0.17
III	0.25
IV	0.35
V	0.45
VI	0.66
VII	0.88
VIII	1.11
IX	1.33
X	1.62
XI	1.91
XII	2.22
XIII	2.54

Spirotheca thin, consisting of tectum and keriotheca throughout, measuring about 0.02 mm thick in the outer whorls. Its inner surfaces between the septa and the septula are frequently attached by a thin dark layer possibly representing the inner tectorium.

Axial septa thin, slender, numerous, and tapering downwards. The septal number in the successive whorls is not yet accurately counted.

Axial septula not well developed, only occasionally seen in the outermost whorls, one growing between a pair of the septa when present.

Primary spiral septula thin, slender, flexible, opposing the parachomata and usually connected with them.

Secondary spiral septula occasionally occur as a short ridge between the primary septula in the outer volutions.

Multiple apertures minute, subcircular.

Proloculum minute, spheroidal, 0.07 mm in diameter.

Horizon and locality: Associated with *Sumatrina annae* Volz in the Chingsichung Limestone, Hutien, Hsiang-hsiang County, Hunan Province.

### *Neoschwagerina multicircumvoluta* Deprat

(Pl. XIV, figs. 5, 6)

1912. *Neoschwagerina multicircumvoluta*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. I, Fasc. III, pp. 50, 51, Pl. II, figs. 7—9; Pl. III, fig. 2.

Test globular; the median zone strongly vaulted, the ends rounded. The axial length and the median width of a specimen with 18½ whorls are 4.02 mm and 3.39 mm respectively; the form ratio is about 1:1.2. In a large test with 20 whorls the two dimensions are 5.29 mm and 4.64 mm. The first one or two whorls coiling round an axis differing at a large angle from that of the rest. All the whorls are regular and more tight than those of *Neoschwagerina craticulifera* Schwager. The adult forms have 20 whorls.

The widths of the whorls measured from a somewhat eccentric axial section are as follows: (in mm):

I	0.08
II	0.16
III	0.22
IV	0.31
V	0.41
VI	0.53
VII	0.68
VIII	0.84
IX	1.04
X	1.22
XI	1.40
XII	1.61
XIII	1.86
XIV	2.10
XV	2.33
XVI	2.65
XVII	2.94
XVIII	3.24

Spirotheca thin, consisting of tectum and keriotheca, with a thickness of 0.027 mm in the last whorl.

Axial septa thin, composed usually of three layers; the lower half darkly solidified.

Axial septula as thick as the septa but much shorter, at first one alternating with the latter but at last two or three present between each pair of the septa.

Primary spiral septula in similar construction to the type of *Neoschwagerina craticulifera* Schwager. They are usually connected with the parachomata. No spiral septula are developed.

Aperture minute, subcircular.

Parachomata run as round ridges.

Proloculum is spheroidal, too minute to be well prepared so that the size is not yet known.

Remarks: This specific name was erected by Deprat in 1912 to cover some forms which built a more globular test and more numerous and compact whorls than its close ally *Neoschwagerina craticulifera* Schwager. In 1927, Ozawa suggested that *Neoschwagerina multicircumvoluta* might represent the microspheric generation of a species with

*Neoschwagerina craticulifera* Schwager as the magalospheric generation. I do not agree with Ozawa's opinion, because the test of *Neoschwag. multicircumvoluta* is globular and has more and closer volutions while *Neoschwagerina craticulifera* always has a fusiform test with much less coils. The proloculum upon which Ozawa laid the basis of his suggestion is equally minute in the two forms, evidently impossible to indicate the presence of alternation of generations in them. The septa and septula are thinner and more slender in the present species than in *Neoschwagerina craticulifera* Schwager. Moreover, the spirotheca of the former species is visibly thinner than that of the latter; it measures 0.027 mm thick in *craticulifera* but only 0.015 mm in the same whorl of *multicircumvoluta*.

Horizon and locality: It occurs in association with *Neoschwag. craticulifera* Schwager in the upper beds of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.

***Neoschwagerina leei* Chen sp. nov.**

(Pl. XI, figs. 1—6)

1927. *Neoschwagerina margaritae*, Ozawa: Journ. Fasc. *Scien. Vol. II*, part 3, pp. 158, 159, Pl. XLII, figs. 5, 7.

Test globular, highly vaulted in the median zone rounded at the extremities. In the mature forms the axial length is about 6.86 mm, the median width about 5.62 mm; the form ratio is 1:1.2. All the volutions are particularly close and regular, and they gradually increase in height, which does not vary visibly from the median zone to the poles. The number of whorls is 16—18.

The widths of the whorls are as follows (in mm):

I	0.14
II	0.22
III	0.25
IV	0.36
V	0.52
VI	0.69
VII	0.88
VIII	1.09
IX	1.30
X	1.55
XI	1.83
XII	2.14
XIII	2.48
XIV	2.77
XV	2.94
XVI	3.46

Spirotheca thin, made up of tectum and keriotheca, measuring only 0.02 mm thick in the outer whorls.

Axial septa thin and slender, generally steeply sloping forward.

Axial septula also slender, at first one alternating with the septa and later their number increasing to two or three.

Primary spiral septula exceedingly thin, somewhat flexuous. This is the most important feature of this species.

Secondary spiral septula not developed.

Apertures circular in the inner whorls, becoming laterally elongated in the outer ones.

Parachomata in the shape of narrow fine ridges, set opposite to the primary spiral septula and usually connected with them.

Proloculum spheroidal and minute, 0.06—0.13 mm in diameter.

Remarks: This form is characterized by the globular test, the numerous whorls, the minute proloculum and

specially the exceptionally thin septa and septula. It is readily distinguished from *Neoschwagerina craticulifera* Schwager by the globular test, and the extremely thin septa and septula. In the outermost whorls the spiral septulum measures only 0.02 mm thick in the present form, but it is 0.040 mm or more in *Neoschwagerina craticulifera* Schwager. The spirotheca of the species under consideration likewise is visibly thinner than that of the latter form. It differs from *Neoschwagerina margaritae* Deprat in the smaller size, and the much thinner septa and septula, although the median zone of the test of our present species is considerably vaulted as in *Neoschwagerina margaritae* Deprat. And moreover in Deprat's form the inner whorls, possibly excepting the first few ones, are more or less rhomboidal, but it is not the case with the present species in which all the whorls are regularly short fusiform.

In 1927, Ozawa described some specimens with specially thin septa and septula under *Neoschwagerina margaritae* Deprat. The specimens, as the illustrations express them, evidently belong to a different species. According to the general structure and especially the exceedingly thin and slender septa and septula, these forms are quite similar to or even identical with our present species possibly except for the difference in size of the test.

Horizon and locality: The present species is found in the Chingsichung Limestone at Hungshantien and Hutien, Hsianghsiang County, Hunan Province. Its associated forms are *Chusenella douvillei* Colani, *Verbeekina verbeeki* Geinitz and *Sumatrina annae* Volz.

### *Neoschwagerina margaritae* Deprat

(Pl. X, figs. 1—3)

1913. *Neoschwagerina margaritae*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. II, Fasc. I, pp. 58—60, Pl. VIII, fig. 10; Pl. IX, figs. 1—3.

1925. *Neoschwagerina margaritae*, Colani: *Mém. Serv. géol. l'Indochine*, Vol. XI, Fasc. I, p. 153, Pl. XXIV, figs. 1—7, 9.

1926. *Neoschwagerina margaritae*, Ozawa: *Journ. Coll. Scien.* Vol. XLV, Art 6, p. 58, Pl. XI, figs. 1, 3.

Test short-fusiform, highly vaulted in the median zone, rounded at the poles. The axial length is 5.28 mm, and the median width 4.11 mm measured from a specimen with 17 whorls; the form ratio is nearly 1:1.3. The first three volutions are round, the next seven or eight more or less rhomboidal, and the rest short-fusiform. All the whorls are regularly and closely coiled. The number of whorls is 18—20.

The widths of the whorls are (in mm):

I	0.17
II	0.23
III	0.35
IV	0.46
V	0.64
VI	0.84
VII	1.06
VIII	1.30
IX	1.52
X	1.77
XI	2.05
XII	2.36
XIII	2.66
XIV	2.98
XV	3.34
XVI	3.76
XVII	4.11

Spirotheca thin, made up of tectum and keriotheca throughout; it measures 0.02 mm thick in the outer whorls.

Spiral septula thin, straight, opposing the parachomata. It has a thickness of only 0.03 mm in the last whorls.

The spiral secondary septula are not developed.

Aperture minute, subcircular with a diameter of about 0.03 mm in the thirteenth volution.

Parachomata in the shape of low, somewhat angular ridges.

Proloculum spheroidal, and minute, 0.10 mm in diameter.

The conditions concerning the axial septa and septula are not known for lack of the median section.

Remarks: This form differs from Deprat's type only in the smaller size and also possibly in the thinner spiral septula. It is acknowledged as a variety of this species because of the globular test, minute proloculum and somewhat rhomboidal inner whorls. It is distinguished from *Neoschwagerina craticulifera* Schwager by the larger number of whorls, the globular test, and the subrhomboidal early whorls. In the structure of the spirotheca and spiral septula, and the size of the proloculum there is almost no difference between the two forms.

Horizon and locality: It occurs not abundantly together with *Verbeeķina verbeeķi* Geinitz in the Wuhsueh Limestone in the hills near Tienchiachun, Kwangchi, southeastern Hupeh. This form has also been found in the Chinghsichung Limestone, Fengkuanshan, Hsianghsiang County, Hunan Province.

### *Neoschwagerina megaspherica* Deprat

(Pl. X, figs. 4—8)

1913 *Neoschwagerina megaspherica*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. II, Fasc. I, p. 57, Pl. VII, figs. 2, 6; Pl. IX, figs. 4—8.

1924. *Neoschwagerina megaspherica*, Colani: *Mém. serv. géol. l'Indochine*, Vol. XI, Fasc. I, pp. 126, 127; Pl. XXII.

1925. *Neoschwagerina megaspherica*, Ozawa: *Journ. Coll. Scien.* Vol. XLV, Art. 6, p. 58, Pl. XI, fig. 8.

Test large, fusiform, with a median zone considerably vaulted and two poles pointed; the lateral slopes occasionally slightly depressed. The axial length and the median width of a specimen with 19 whorls are 7.63 and 3.57 mm respectively; the axial ratio is 1:2.1. The first three whorls globular; the next ones gradually becoming fusiform. All the whorls are closely coiled with a height of only 0.043 mm in the tenth volution. The number of whorls in the adult forms is 16—19.

The widths of the whorls are (in mm):

I	0.97
II	1.22
III	1.42
IV	1.64
V	1.80
VI	2.01
VII	2.17
VIII	2.36
IX	2.56
X	2.82
XI	3.11
XII	3.41
XIII	3.72

Spirotheca extremely thin, only 0.023 mm thick in the tenth volution. It is composed of tectum and keriotheca.

Axial septa exceedingly thin, with a construction of three principal layers; the lower part is opaquely solidified.

Axial septula as thick as the septa but much shorter and varying in length. They begin singly in the interspaces of the septa in the latter part of the first volution and gradually increase to 4 or 5 between a pair of septa in the outermost volutions.

Primary Spiral septula thin, rather regular in thickness in the inner whorls but becoming irregular in the outer ones. Their lower edges point to and connect with the summit of the parachomata.

Secondary spiral septula very short, like ridges, first appearing in the tenth volution and intercalated between the primary septula.

Aperture minute, subcircular.

Parachomata generally in the form of subangular ridges.

Proloculum large, thin-walled, usually deformed-spheroidal, having a diameter of 0.77 mm.

Remarks: This species distinguishes itself from the allied species essentially by its wonderfully large proloculum and more compact whorls. It is much similar to *Neoschwagerina douvillei* Ozawa in many points. But the typical forms of the latter have a much smaller proloculum and comparatively loose volutions. In fact, the difference between the two forms is still so slight and intermediate forms present in the faunule are so many that I believe that these two forms may represent different generations of one and the same species.

Horizon and locality: This form is found in abundant occurrence in the Maok'ou Limestone in the vicinity of Chenkiang, Kwangsi Province. Its association is the same as that of *Neoschwagerina douvillei* Ozawa.

### Genus *Yabeina* Deprat, 1914

**Genotype** *Neoschwagerina* (*Yabeina*) *inouyei* Deprat = *Neoschwagerina globosa* Yabe = *Yabeina globosa* (Yabe), 1914.

Test short-fusiform to globular; whorls close; spirotheca composed of tectum and keriotheca throughout; axial septa, axial septula, transverse septa and transverse septula are developed and half consolidated; aperture in a row of minute round pores; parachomata fine, meeting the transverse septa; proloculum minute or large.

Range: Permian of Asia, Europe, Africa and North America.

### *Yabeina shiraiwensis* Ozawa

(Pl. XIV, figs. 8—10)

1925. *Yabeina shiraiwensis*, Ozawa: *Journ. Coll. Scien.* Vol. XLV, Art. 6, pp. 63, 64; Pl. X, figs. 1, 2; Pl. II, figs. 2b, 5c, 7b.

Test elongately fusiform, slightly curved in most cases; the median zone moderately vaulted, the ends bluntly pointed. The axial length is 8.34 mm and the median width 3.27 mm in a specimen with twelve whorls; the form ratio is 1:2.5. In the more elongate forms the form ratio may reach 1:2.8. All the whorls are close; the first two or three are more globular, while the rest gradually extend laterally to become fusiform. The number of whorls is usually 12 or 13, rarely to 17.

Two measurements on the width of the whorls are given below (in mm):

Proloculum	0.38	0.35
I	0.50	0.50
II	0.59	0.67
III	0.71	0.84
IV	0.82	0.99
V	0.97	1.20
VI	1.12	1.42



VII	1.30	1.67
VIII	1.54	1.98
IX	1.80	2.28
X	2.11	2.59
XI	2.45	2.90
XII	2.81	3.25
Specimen	(5541)	(5126)

Spirotheca exceedingly thin, composed of tectum and keriotheca throughout. The thickness of the spirotheca is about 0.013 mm in the outer whorls.

Axial septa thin and slender, with the lower part usually swollen and consolidated.

Axial septula appear early in the second or even in the first whorl, at first alternating with the septa; they increase up to four or five in each septal interspace in the outermost whorls. Their lower edges are also somewhat enlarged.

Primary spiral septula thin, slender, varying in thickness in the different parts of the individual septula.

Secondary spiral septula short, well developed in the outer whorls where usually one or occasionally two of them are found between each pair of the primary septula.

Apertures minute, subcircular, numerous.

Parachomata narrow but rather high, rising to meet the lower ends of the primary spiral septa.

Proloculum generally spheroidal with a diameter of 0.35—0.44 mm.

Remarks: Our form undoubtedly belongs to Ozawa's species for the essential characters of both forms are quite similar although the Chinese form has a more elongate test than the Japanese type.

Horizon and locality: It is associated with *Chusenella douvillei* Colani, *Chusenella deprati* Ozawa and *Sumatrina annae* Volz in the lower beds of the Chinghsichung Limestone, Hutien, Hsianghsiang, County, Hunan Province. It is also found in abundance together with *Neoschwagerina craticulifera* Schwager and *Chusenella douvillei* Colani in the Wuhsueh Limestone in the hills near Tienchiachun, Kwangchi County, southeastern Hupeh.

### ***Yabeina inouyei* Deprat**

(Pl. XI, figs. 7, 8)

1914. *Yabeina inouyei*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. III, Fasc. I, pp. 30—34; Pl. VI, figs. 4—10; Pl. VII, figs. 1, 2.

1924. *Neoschwagerina inouyei*, Colani: *Mém. Serv. géol. l'Indochine*, Vol. XI, Fasc. I, pp. 125—126, Pl. XXVIII.

This species in our collection is only represented by several incomplete para-axial sections, but the essential characters are plainly displayed. The test is large, short, fusiform with the median zone considerably vaulted and the poles rounded. In one section 18 whorls are seen and the width measures 5.03 mm and the length 8.10 mm. Whorls are numerous, attaining to 20, and are regularly and tightly coiled. Spirotheca exceedingly thin, consisting of tectum and keriotheca throughout. The primary spiral septula particularly thin and more so in the last two or three whorls. The secondary spiral septula well developed in the outer volutions, one between every two of the primary septula and about half as long as the latter; the upper parts of the two are frequently coalesced. The multiple apertures minute, subcircular. The parachomata well developed in the inner whorls but somewhat obsolescent in the outermost volution. The axial septa are composed of three layers, and their lower portion is always coalesced, darkened and bending forward. The axial septula vary in strength, some longer and some shorter, one or two existing between each pair of septa in the inner whorls and three or four in the outer volutions. The shape and size of the proloculum are unknown.

Horizon and locality: It occurs together with *Sumatrina annae* Volz in the lower beds of the Chinghsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.

***Yabeina proboscis* Chen sp. nov.**

(Pl. XIII, figs. 8—10)

Test elongately fusiform, considerably vaulted in the median zone, wonderfully produced to incurved proboscis at the poles thus rendering the test to look grotesque. The axial length and the median width measured from a regular specimen are 9.05 mm and 2.96 mm respectively; the axial ratio is 1:3. In a para-axial section of the odd specimen the length of the test attains to 14.88 mm and the width 4.05 mm. Whorls compact, numerous, counting 17 in the normal form. The lateral parts of the outer whorls strongly prolonged and at the same time irregularly curved.

The widths of the whorls of a regular form are as follows (in mm):

I	0.28
II	0.41
III	0.58
IV	0.76
V	0.97
VI	1.14
VII	1.31
VIII	1.48
IX	1.65
X	1.83
XI	1.99
XII	2.10
XIII	2.32
XIV	2.47
XV	2.63
XVI	2.76
XVII	2.96

Siprotheca extremely thin, consisting always of tectum and fine keriotheca the latter of which is particularly weakly developed.

Axial septa thin, slender, composed of three layers with the lower part coalesced and darkened.

Axial septula vary in strength and their lower portions are also darkly solidified. In the last whorls three of them are thrust between each pair of septa.

The primary spiral septula very thin, opposing the tops of the parachomata. The secondary spiral septula not well developed, only occasionally appearing as short rudimentary ridges in the interspace between the spiral septula.

Aperture minute, subcircular.

Parachomata in the shape of fine spiral ridges.

Proloculum moderate-sized, 0.20 mm or more in diameter.

Horizon and locality: This species found together with other *Neoschwagerina* in the Maok'ou Limestone, Chengkiang, Kwangsi Province.

***Yabeina* sp.**

(Pl. VII, fig. 12)

It is a very rare form. In our collection only a submedian section has been obtained. This section is cut through at some distance from the proloculum, and fifteen close whorls are sighted. The observed width measures 3.16 mm. The

keriotheca is poorly developed in some small parts of the spirotheca in the innermost whorls, but almost entirely disappears in the next ten volutions, where the spiral wall is composed merely of a single layer of thin solid tectum. Nevertheless, the spiral wall of the last whorl, though still thin, is much thicker than that of the immediate inner whorls; it is perhaps made up of tectum and consolidated keriotheca.

The axial septa and septula in the outer whorls are perfectly consolidated and irregularly warped, and they can be distinguished only by the difference in length still with some difficulty. Those in the inner volutions occasionally have the uppermost part unconsolidated.

Horizon and locality: This form is found in association with *Neoschwagerina douvillei* Ozawa in the Maok'ou Limestone at Chinkiang, Kwangsi Province.

### Genus *Afghanella* Thompson, 1946

**Genotype** *Afghanella schencki* Thompson, 1946, *Journal of Palaeontology*, vol. 20, pp. 153—155, figs. 1—12.

Test inflated-fusiform; whorls closely and regularly coiled; spirotheca consists of tectum and not well developed keriotheca of fine structure; axial septa inclining forward with a thin upper part and a thick lower part; one axial septulum intercalated between the axial septa in the inner whorls but 2 to 4 inserted in the space between the adjacent axial septa in the outer whorls; the primary transverse septula joining the parachomata; the secondary transverse septula first appearing one between two adjacent primary septula, and later increasing to 2 in the same space; parachomata small and numerous; foramina subcircular: proloculum small or large, often irregular in shape when large.

Range: Permian of Asia.

### *Afghanella schencki* Thompson

(Pl. XII, figs. 4—9)

1946. *Afghanella schencki* Thompson: *Journal of Palaeontology* Vol. 20, No. 2, pp. 153—155; Pl. XXV, figs. 1—12.

Test small, ellipsoidal, with a length of 3.73 mm and a width of 2.51 mm; the proportion of the latter to the former is 1:1.5. All the whorls are ellipsoidal, and closely and quite regularly coiled. The number of whorls is 10.

Spirotheca consists of tectum and keriotheca, the latter of which is finely alveolar; on the outer surface of the tectum there appears a thin layer of solid mass which may result from the lateral spreading of the parachomata and possibly represents the outer tectorium.

The Primary spiral septula have thin upper part and a swollen lower part which produces downwards to meet the parachomata.

The Secondary spiral septula are short, first appearing in the fifth whorl and alternating with the primary septula. Apertures subcircular, minute and numerous.

Parachomata are built in the comparatively coarse spiral ridges and the lateral sides of the base usually spread to meet together.

Axial septa rather thick, with the lower free ends consolidated and opaque.

Axial septula short, only developed in the outer whorls, one inserted between each pair of the axial septa.

Proloculum spheroidal, small, measuring 0.16—0.24 mm in diameter.

The widths of the whorls (specimen 5609) are given below (in mm):

I	0.26
II	0.43

III	0.57
IV	0.77
V	1.03
VI	1.24
VII	1.51
VIII	1.74
IX	2.05
X	2.35

Horizon and locality: The specimens of this species were collected from the maok'ou limestone, Chunsan, Kwangsi Province. The associated fossils are yet unknown.

### ***Afghanella sumatrinaeformis* Gubler**

(Pl. VII, figs. 9—11)

1935. *Neoschwagerina sumatrinaeformis* Gubler: Les Fusulinides du Permien de L'Indochine, *memoire la Societe Geologique de France*, new series, vol. XI, Fasc. A, Parts 36 to 37.

Test large, fusiform, 8.61 mm long and 4.61 mm broad, considerably vaulted in the median zone, rounded at the poles; the first three or four whorls are more globular, the next ones fusiform; all the whorls are tightly coiled; the number of whorls is 12.

The widths of the whorls are as follow (in mm):

I	0.80
II	1.08
III	1.39
IV	1.68
V	1.98
VI	2.28
VII	2.66
VIII	3.02
IX	3.50
X	3.93

Spirotheca very thin, composed of a single layer of tectum in the inner whorls but distinctly consisting of tectum and keriotheca in the outer volutions.

Primary spiral septula short, extending downwards to the half-way of the chamber-height; they are made up of the lower inflated and consolidated mass and the upper thin translucent piece when they extend from the keriotheca, otherwise they are altogether consolidated.

Secondary spiral septula are like the other septula in shape, differing only in smallness and shortness; a small number of them are made up of only a thin straight piece; usually one occasionally two of them occur between each pair of the primary septula.

Axial septa in the outer whorls are composed of three layers, of which the middle one is the incurved part of the spirothecal tectum, and the other two are the anterior and posterior laminae of the keriotheca.

Axial septula are like the spiral septula in all characters; at first one interposed between each pair of the septa, later on two or three, rarely four, are inserted in the septal interspace.

Apertures numerous, minute, subcircular.

Proloculum extraordinarily large, spheroidal, with a diameter of 0.63 mm.

Remarks: In the fusiform shape of the test, the large proloculum and the growth of the septa and septula, the

present form is very similar to the Akasaka species. But some slight differences still exist between them: in the nearly same transverse dimension, the Akasaka form has three more whorls than the Yunnan specimen, when the proloculum is nearly of the same size. The spiral septa and septula seem to have a regular thickness in the former, but the lower parts of them in the latter are inflated.

Furthermore, the largest specimen in our collection possesses only  $11\frac{1}{2}$  whorls, while the number of whorls in the Japanese form may reach 21.

Horizon and locality: It occurs in moderate abundance and associates with *Verbeeķina verbeeķi* Geinitz and *Neoschwagerina* sp. in the Maok'ou limestone at Ning-ērĥ, Yunnan Province.

### Genus *Sumatrina* Volz, 1904

#### Genotype, *Sumatrina annae* Volz, 1904.

Test elongately fusiform or subcylindrical; spirotheca composed of a single layer of tectum; four kinds of internal partitions developed with the lower edges swollen; the axial septa thick and long, the axial septula short, of equal length, usually two or three intercalated between each pair of the septa; the primary spiral septula extending from the tectum to meet the parachomata, the secondary spiral septula shorter than the primary one, similar to the axial septula in structure and uniform in length, and usually two (occasionally one) disposed between two primary spiral septula; multiple aperture small, subcircular, numerous; parachomata in the form of small ridges; proloculum moderately large.

Range. Permian of the Tethys sea area.

#### *Sumatrina annae* Volz

(Pl. VII, figs. 7, 8)

1904. *Sumatrina annae*, Volz: Zur Geologie von Sumatra, *Geol. u. Pal. Abh. herausgegeben vom Kohen*, Vol. X, Cah. 2, p. 24; Neue Folge Vol. VI.
1906. *Neoschwagerina annae*, Yabe: A Contribution to the Genus Fusulina, *Journ. Coll. Scien.* Vol. XXI, Art. 5.
1906. *Sumatrina annae*, Douville: Calcaires à Fusulines de l'Indochine, *B. S. G. Fr.*, Ser. 4, Vol. VI, pp. 561—576.
1909. *Neoschwagerina annae*, Hayden: Fusulinidae from Afghanistan, *Rec. Geol. Surv. India*, Vol. XXXVIII, Pt. 3, pp. 250—251, Pl. XXII, figs. 8—14.
1912. *Sumatrina annae*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. I, Fasc. III, pp. 56—57, Pl. V, figs. 1—15.
1924. *Sumatrina annae*, Colani: *Mém. Serv. géol. l'Indochine*, Vol. XI, Fasc. I, pp. 150—152, Pl. XX, fig. 20; Pl. XXI, figs. 1—8, 10—13, 16, 28.
1925. *Sumatrina annae*, Ozawa: *Journ. Coll. Scien.* Vol. XLV, Art 4, p. 26, Pl. I, fig. 10; Pl. II, figs. 11, 12.
1925. *Sumatrina annae*, Ozawa: *Journ. Coll. Scien.* Vol. XLV, Art 6, p. 64, Pl. X, fig. 8, Pl. , figs. 1b, 2b.
1927. *Sumatrina annae*, Ozawa: *Journ. Fac. Scien.* Vol. II, Pt. 3, p. 161, Pl. XXXIV, figs. 20, 21.

This species is represented by several oblique thin sections. The median width is 1.73 mm in a specimen which has seven whorls; the axial length is about 4.10 mm and the median width 1.60 mm in another case. Whorls are comparatively loose.

The widths of the successive whorls are as follows (in mm):

I	0.38
II	0.48
III	0.65
IV	0.87
V	1.14
VI	1.45
VII	1.73

Spirotheca is made up of a mere layer of tectum, rather even in the early whorls, but gently wrinkled equatorially in the last one.

Axial septa distantly spaced, the lower part usually enlarged.

Axial septula short, somewhat irregularly disposed, some bending this way and others that way. They begin to appear two between a pair of septa, and later on four or five intercalated between two of the septa. The lower ends of the septula are slightly inflated.

The primary spiral septula are with thick lower edges opposing the parachomata and usually connected with them.

The secondary spiral septula short, somewhat enlarged in the lower parts, usually two, rarely one or three being arranged in the interspace between the primary septula.

Parachomata well running in the form of fine ridges.

Apertures minute, elliptical.

Proloculum spheroidal, comparatively large, 0.26 mm in diameter.

Horizon and locality: It is found in rare occurrence in the Chingsichung Limestone, Hutien, Hsianghsiang County, Hunan Province and in the Wuhsueh Limestone, in the hills near Tienchiachun, Kwangchi County, Hupeh Province. Its association is the same as that of *Sumatrina longissima* Deprat. It occurs together with *Neoschwagerina simplex* Ozawa, *Verbeeķina verbeeķi* Geinitz, *Neoschwagerina craticulifera* Schwager, *Neoschwagerina megaspherica* Deprat *Neoschwagerina douvillie* Ozawa and *Pseudodoliolina ozawai* Yabe and Hayzawa in the Maok'ou Limestone at Chunsan, Kwangsi Province.

### *Sumatrina longissima* Deprat

(Pl. VII, figs. 4—6)

1914. *Sumatrina longissima*, Deprat: *Mém. Serv. géol. l'Indochine*, Vol. III, Fasc. I, pp. 36, 37, Pl. V, figs. 1—6.

Test subcylindrical with rounded terminations, occasionally the median zone very slightly arched. The axial length and the median width of a specimen with 9 whorls are 5.59 mm and 1.62 mm respectively. The axial ratio derived from the above figures is 1:3.4. Whorls are closely coiled. The first whorl is more ellipsoidal and the next ones gradually changing through fusiform into subcylindrical. The number of whorls in adult forms is 9 or 10.

The widths of the whorls of some specimens are tabulated below:

	Whorls									Specimen
	I	II	III	IV	V	VI	VII	VIII	IX	
Width (in mm)	0.31	0.40	0.46	0.59	0.75	0.93	1.15	1.39	1.62	4957
	0.38	0.53	0.65	0.85	1.08	1.31	1.55	1.77		4947
	0.38	0.50	0.66	0.90	1.18	1.46				

Spirotheca consisting of a single layer of thick tectum and finely furrowed externally at the positions where the primary and the secondary spiral septula exist.

Axial septa are somewhat club-shaped in section, widely spaced; the upper part is thin and the lower part considerably thickened. Their lower free ends are generally pointing forward. They number 9, 16, 16, 17, 20, 23, and 24 respectively in seven successive whorls. In one case where the septa are more distant-spaced their number is only 18 each in the sixth and seventh volutions.

Axial septula short and thin with the lower ends slightly thickened, extending down a little more than 1/3 the height of the chambers in the outer whorls. At first, two septula are inserted between the septa and afterwards the number gradually increases up to five or six in the outermost volutions.

The primary spiral septula widely spaced, not very long, reaching nearly the midway of the vertical distance between the two successive spiral walls. Their upper part as thick as that of the secondary septula, while the lower

part highly swollen.

The secondary spiral septula also thin and short, as long as the axial septula. Their lower ends are somewhat roundly thickened as well. They are not developed at least in the early part of the first whorl. When they make their first appearance one septulum is intercalated between the primary septula. In the last whorls two or three secondary septula are built in the interspace between the primary septula, but the number is not constant even in the same whorl.

Parachomata are developed in round, low and narrow ridges, and distantly separated.

Apertures elliptical, widely spaced.

Proloculum large, thick-walled, variable in shape; when spheroidal, its diameter measures 0.21—0.28 mm.

Horizon and locality: This species is found in great abundance together with *Verbeekina verbeeki* Geinitz, *Schwagerina hunania* Chen and *Sumatrina annae* Volz in the Chingsichung Limestone, Hutien, Hsianghsiang County, Hunan Province.



圖 版 說 明

圖版 I (PLATE I)

Figs. 1-3. *Ozawainella hunanensis* (sp. nov.)

1. Axial section of a thick specimen, Maok'ou Limestone, Chenkiang, Kwangsi Province.  $\times 15$ . (Cat. No. 1824)  
廣西省遷江, 茅口灰岩

2. A slightly oblique axial section, Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.  $\times 15$ . (Cat. No. 4962)  
湖南省湘鄉, 壺天, 清溪沖灰岩

3. Axial section showing the tooth-like chomata on the lateral slopes near the angular periphery. Chingsichung Limestone, Hutien Hunan Province.  $\times 15$ . (Cat. No. 4961)  
湖南省湘鄉縣, 壺天, 清溪沖灰岩

Figs. 4-7. *Nankinella inflata* (Colani), Maok'ou Limestone, Kwangsi Province.

廣西省崇善, 龍王村, 茅口灰岩

4, 5. Axial sections.  $\times 15$ . (Cat. Nos. 5641, 5629)

6, 7. Median sections.  $\times 15$ . (Cat. Nos. 5633, 5629)

Figs. 8-11. *Yangchienia kwangsiensis* (sp. nov.), Maok'ou Limestone, Liangyun, Kwangsi Province.

廣西省凌雲, 茅口灰岩

8. An oblique section of a large form.  $\times 15$ . (Cat. No. 5317)

9. An axial section.  $\times 15$ . (Cat. No. 5305)

10. An axial section, showing the strong broad chomata.  $\times 15$ . (Cat. No. 5311)

11. A median section.  $\times 15$ . (Cat. No. 5311)

Figs. 12. *Schwagerina subobsoletus* var. *okuboensis* Ozawa.

An axial section, showing the close whorls, gently fluted septa and minute proloculum. Chingsichung Limestone, Hungshantien, Hsianghsiang, Hunan Province.  $\times 15$ . (Cat. No. 5379)

湖南省湘鄉縣, 洪山殿, 清溪沖灰岩

Figs. 13-16. *Schwagerina tieni* (sp. nov.), Chingsichung Limestone, Hutien, Hunan Province.

湖南省湘鄉縣壺天, 清溪沖灰岩

13. A slightly oblique para-axial section.  $\times 15$ . (Cat. No. 5059)

14. A slightly oblique axial section.  $\times 15$ . (Cat. No. 5059)

15. A median section.  $\times 15$ . (Cat. No. 5058)

16. A sub-median section.  $\times 15$ . (Cat. No. 5057)

Figs. 17-18. *Schwagerina kwangchiensis* (sp. nov.), Wuhsueh Limestone, Kwangchi, Hupeh Province.

湖北省廣濟, 武穴灰岩

17. A slightly oblique axial section.  $\times 12$ . (Cat. No. 4698)

18. An incomplete axial section.  $\times 15$ . (Cat. No. 4671)

Figs. 19-21. *Schwagerina henbesti* (sp. nov.), Wuhsueh Limestone, Kwangchi, Hupeh Province.

19. An incomplete axial section, showing two clear stages of development of whorls.  $\times 12$ . (Cat. No. 4635)

20. A para-axial section.  $\times 10$ . (Cat. No. 5450)

21. A sub-median section.  $\times 12$ . (Cat. No. 4655)

Figs. 22-24. *Gallowainella minima* (sp. nov.)

22. An axial section, showing the regular and intense fluting of the septa.  $\times 30$ . (Cat. No. 5475). Chingsichung Limestone, Hsianghsiang, Hunan Province.

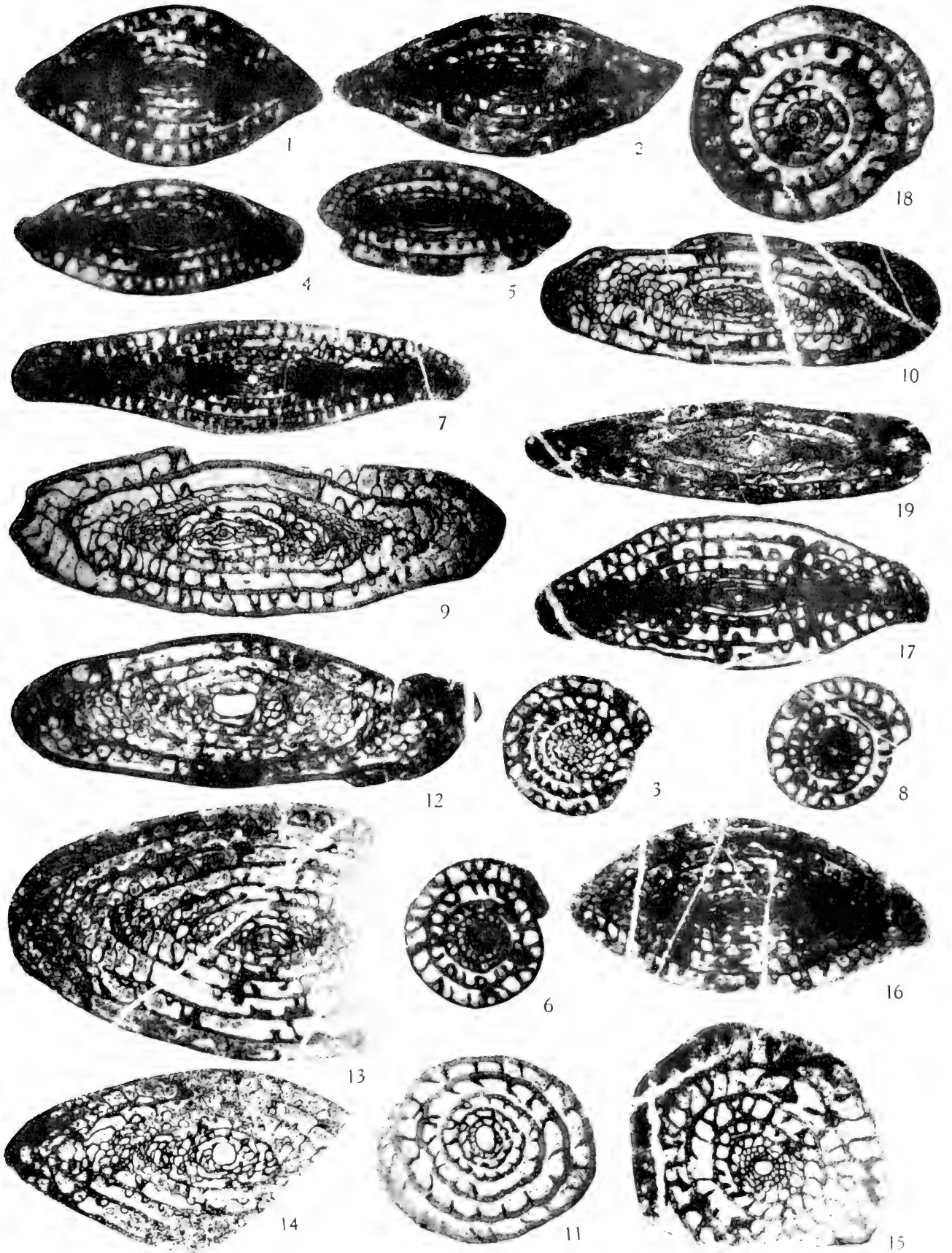
23. An axial section of a young form.  $\times 30$ . (Cat. No. 5388). Chingsichung Limestone, Hsianghsiang, Hunan Province.

24. A median section, showing the two-layered structure of the spirotheca.  $\times 30$ . (Cat. No. 5283). Wuhsueh Limestone, Kwangchi, Hupeh Province.



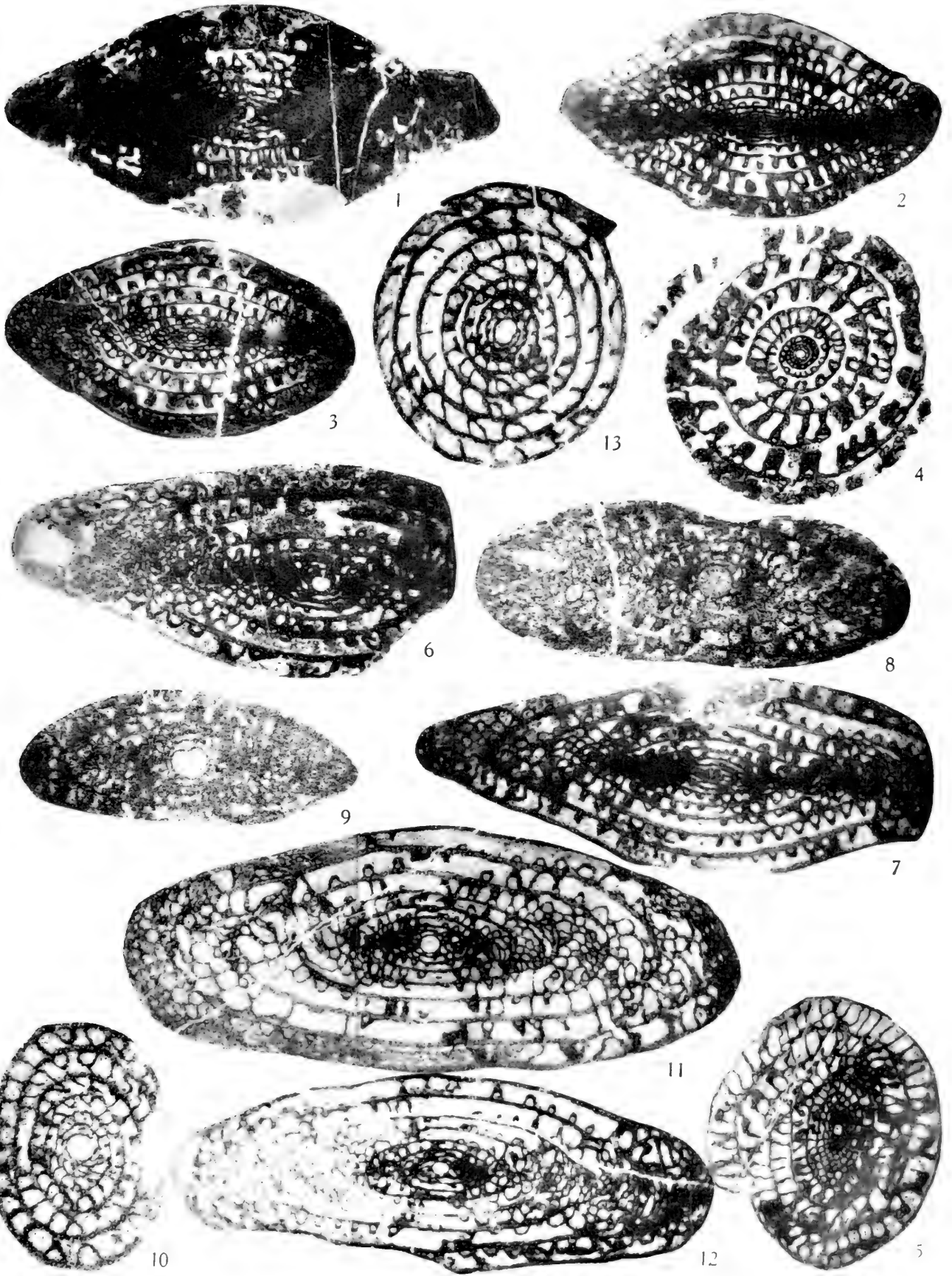
## 圖版 II (PLATE II)

- Figs. 1-3. *Chusenella tingi* (sp. nov.). Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.
- 1, 2. Axial sections, showing the close inner whorls.  $\times 15$ . (Cat Nos. 4927, 4800)
3. A median section.  $\times 15$ . (Cat. No. 4866)
- 4-6. *Schwagerina wuhsuehensis* (sp. nov.) Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.
4. An axial section.  $\times 15$ . (Cat. No. 4643)
5. An oblique section.  $\times 15$ . (Cat. No. 4631)
6. A median section.  $\times 15$ . (Cat. No. 4642)
- 7, 8. *Schwagerina longipertica* (sp. nov.).
7. An axial section, Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province,  $\times 15$ . (Cat. No. 5166)
8. A median section, Chingsichung Limestone, Hutien, Hunan Province.  $\times 15$ . (Cat. No. 4853)
- 9-11. *Schwagerina paralpina* (sp. nov.). Chingsichung Limestone, Hutien, Hunan Province.
- 9, 10. Axial sections.  $\times 15$ . (Cat. Nos. 5050, 4786).
11. A median section of a somewhat doubtful form with a large proloculum.  $\times 15$ . (Cat. No. 4787)
12. *Schwagerina megalocula* (sp. nov.)  
An axial section of a specimen with few whorls and a particularly large proloculum. Chingsichung Limestone, Hutien, Hunan Province.  $\times 15$ . (Cat. No. 4804)
- 13-15. *Schwagerina skinneri* (sp. nov.). Chingsichung Limestone, Hutien, Hunan Province.
13. A greater part of a para-axial section.  $\times 15$ . (Cat. No. 4819)
14. An incomplete axial section.  $\times 15$ . (Cat. No. 4826)
15. A median section.  $\times 15$ . (Cat. No. 4826)
- 16-18. *Chusenella deprati* (Ozawa).
16. An axial section.  $\times 15$ . Chingsichung Limestone, Hutien, Hunan Province. (Cat. No. 4795).
17. An axial section of a slender form.  $\times 15$ . Wuhsueh Limestone, Kwangchi, Hupeh Province. (Cat. No. 5109)
18. A median section.  $\times 15$ . Chingsichung Limestone, Hutien, Hunan Province. (Cat. No. 4952)
19. *Schwagerina yüi* (sp. nov.).  
An axial section, showing the exceedingly thin spirotheca and the moderately large proloculum, Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  $\times 15$ . (Cat. No. 4701).



圖版 III (PLATE III)

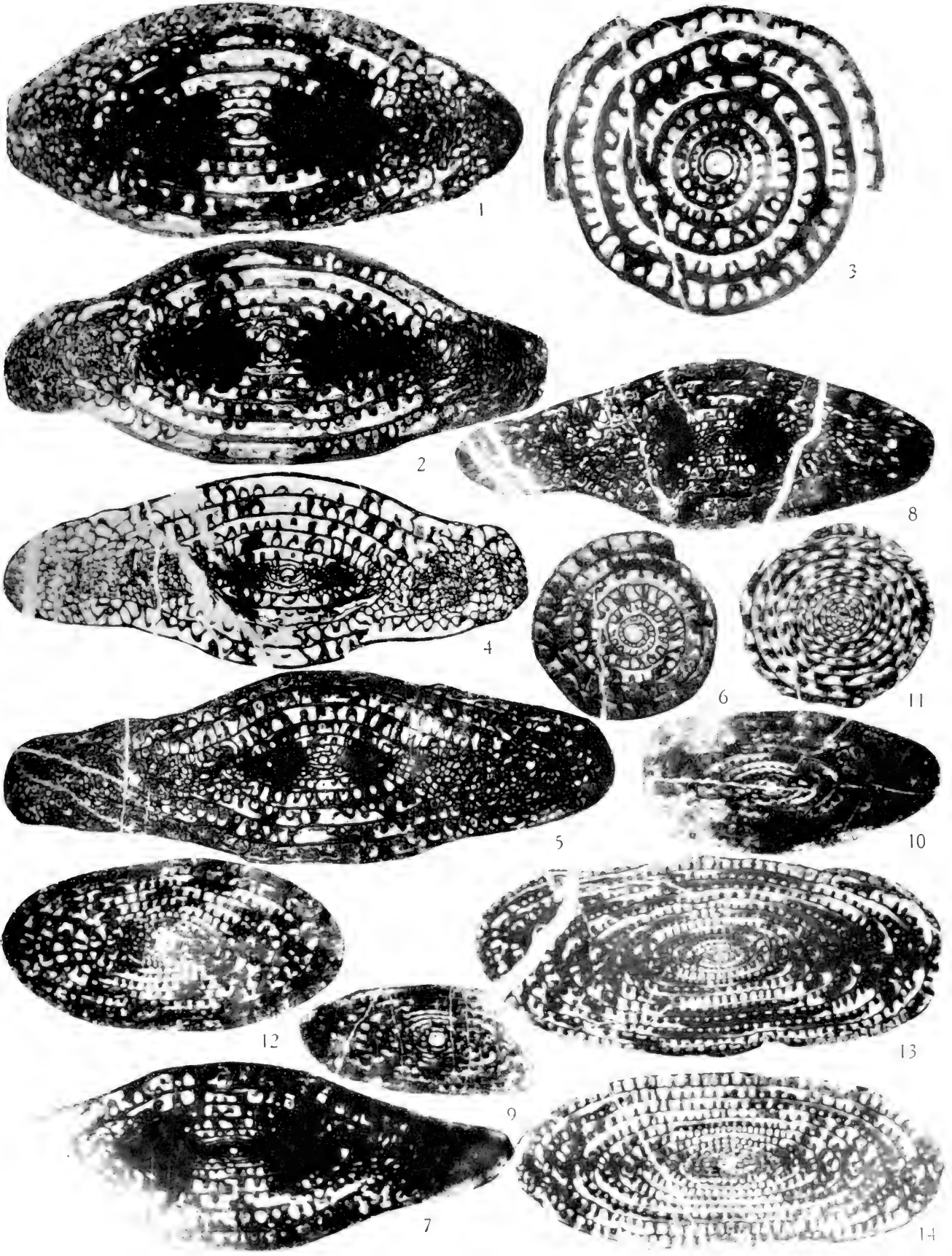
- Fig. 1. *Schwagerina tienchiaensis* (sp. nov.).  
An axial section,  $\times 15$ . Wuhsueh Limestone, Kwangchi, Hupeh Province. (Cat. No. 5438)
- Figs. 2-5. *Chusenella douvillei* (Colani).  
2. An axial section of a typical form. Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  $\times 10$ . (Cat. No. 5529)  
3. An axial section. Chingsichung Limestone, Hutien, Hunan Province.  $\times 10$ . (Cat. No. 4782)
- Figs. 4, 5. Median sections. Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  $\times 10$ . (Cat. Nos. 4677, 4713)
- Figs. 6, 7. *Schwagerina exilis* (Schwager)  
6. An incomplete axial section. Maok'ou Limestone, Chinkiang, Kwangsi Province.  $\times 15$ . (Cat. No. 5178)  
7. A para-axial section. Chingsichung Limestone, Fengkuanshan, Hsianghsiang, Hunan Province.  $\times 15$ . (Cat. No. 1205)
- 8-10. *Schwagerina lingyunensis* (sp. nov.).  
From the Maok'ou Limestone, Lingyun, Kwangsi Province.  
8, 9. Two slightly oblique axial sections.  $\times 15$ . (Cat. Nos. 5324, 5323)  
10. A somewhat oblique median section.  $\times 15$ . (Cat. No. 5321)
- 11-13. *Schwagerina hunania* (sp. nov.)  
From the Chingsichung Limestone, Hutien, Hunan Province.  
11. An axial section of a loose form.  $\times 15$ . (Cat. No. 5521)  
12. An axial section of a typical form.  $\times 15$ . (Cat. No. 4803)  
13. A median section.  $\times 15$ . (Cat. No. 4817)



圖版 IV (PLATE IV)

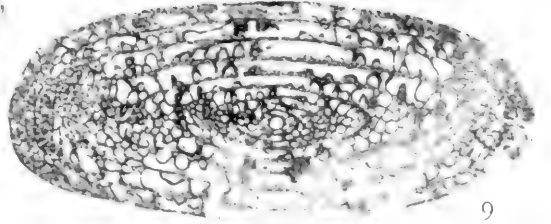
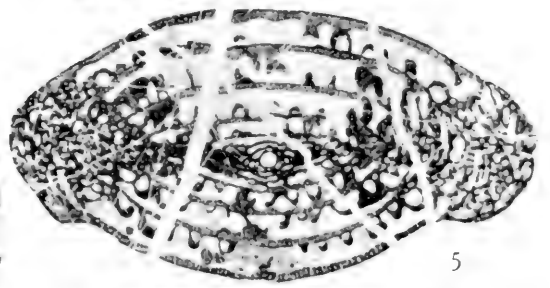
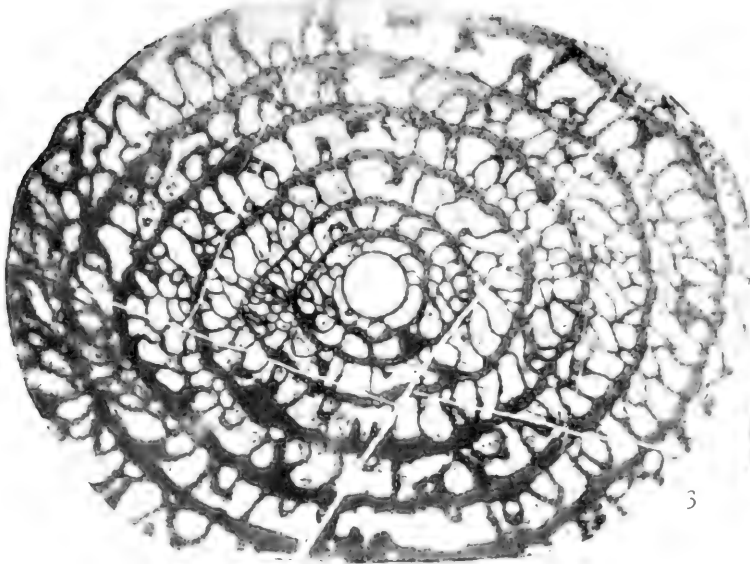
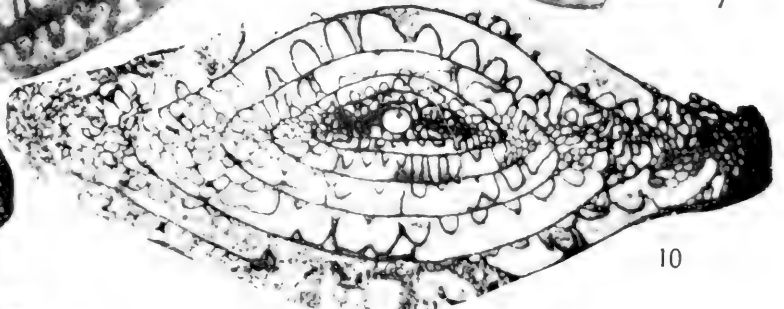
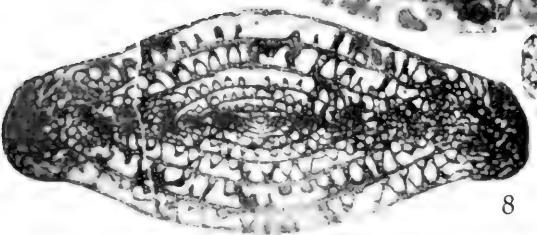
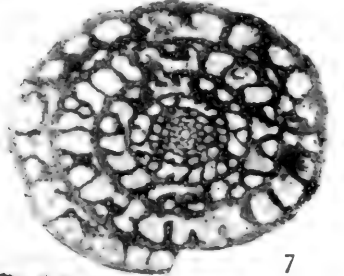
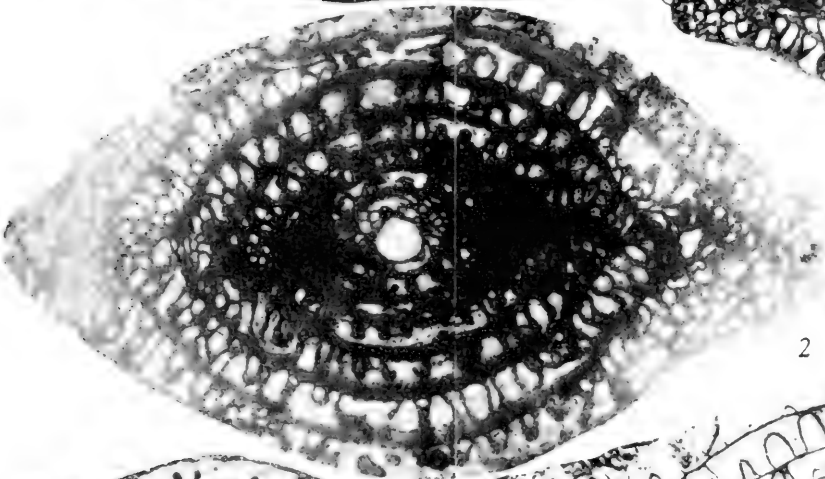
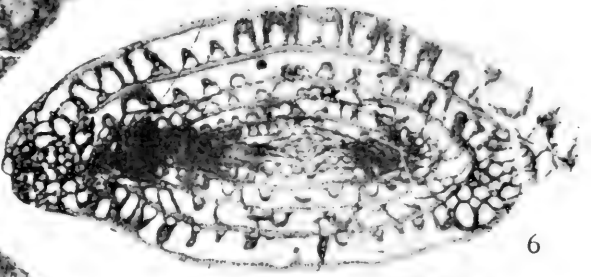
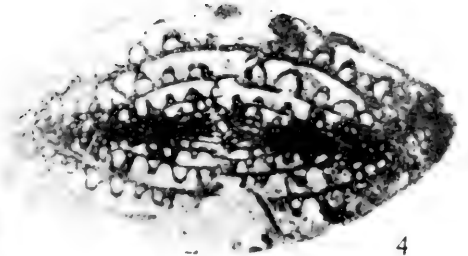
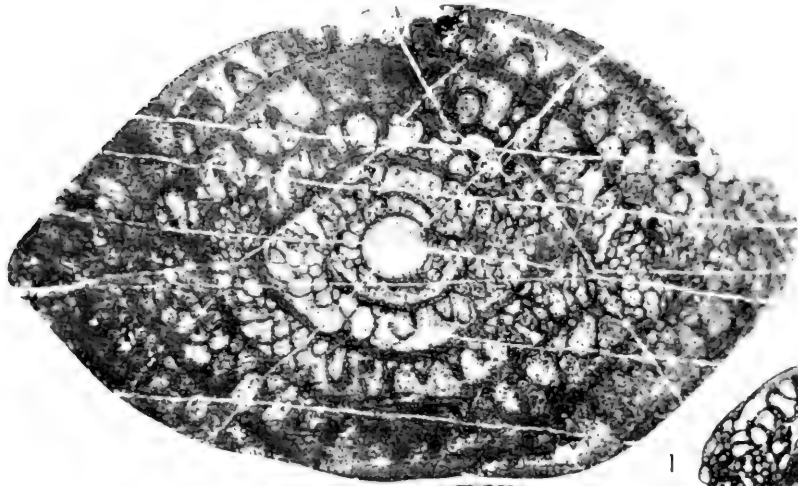
- 1-3. *Schwagerina yunnanensis* (sp. nov.)  
1, 2. Axial sections, Maok'ou Limestone, Ning-erh, Yunnan Province.  $\times 15$ . (Cat. Nos. 6322, 6323)  
3. A median section, Ning-erh, Yunnan Province.  $\times 15$ . (Cat. No. 6274)
- 4-6. *Schwagerina longitermina* (sp. nov.)  
From the Chingsichung Limestone, Hutien, Hunan Province.  
4. An axial section.  $\times 10$ . (Cat. No. 4767)  
5. An axial section of a typical form with highly produced poles.  $\times 10$ . (Cat. No. 4735)  
6. A median section.  $\times 10$ . (Cat. No. 4736)
- 7, 8. *Chusenella conicocylindrica* (sp. nov.).  
7. A somewhat oblique axial-section, showing the median cylindrical portion and the lateral conical regions.  $\times 15$ . (Cat. No. 4773). Chingsichung Limestone, Hutien, Hunan Province.  
8. A diagonal section.  $\times 10$ . (Cat. No. 5250). Chingsichung Limestone, Hutien, Hunan Province.
- 9-11. *Misellina compacta* (sp. nov.)  
From the lower part of the Wuhsuch Limestone, Tienchiachun, Kwangchi, Hupeh Province.  
9, 10. Axial sections.  $\times 15$ . (Cat. Nos. 4574, 4512)  
11. A median section which seems to be of the microspheric form.  $\times 15$ . (Cat. No. 4690)
- 12-14. *Pseudodoliolina ozawai* Yabe and Hanzawa.  
12. An axial section of a specimen with a large proloculum, possibly representing the megalospheric form.  $\times 15$ . (Cat. No. 4743)  
Chingsichung Limestone, Hutien, Hunan Province.  
13. An axial section, Chingsichung Limestone, Hutien, Hsianghsiung Hunan Province.  $\times 15$ . (Cat. No. 4744)  
14. An axial section, Maok'ou Limestone, Hochien, Kwangsi Province.  $\times 15$ . (Cat. No. 5078)





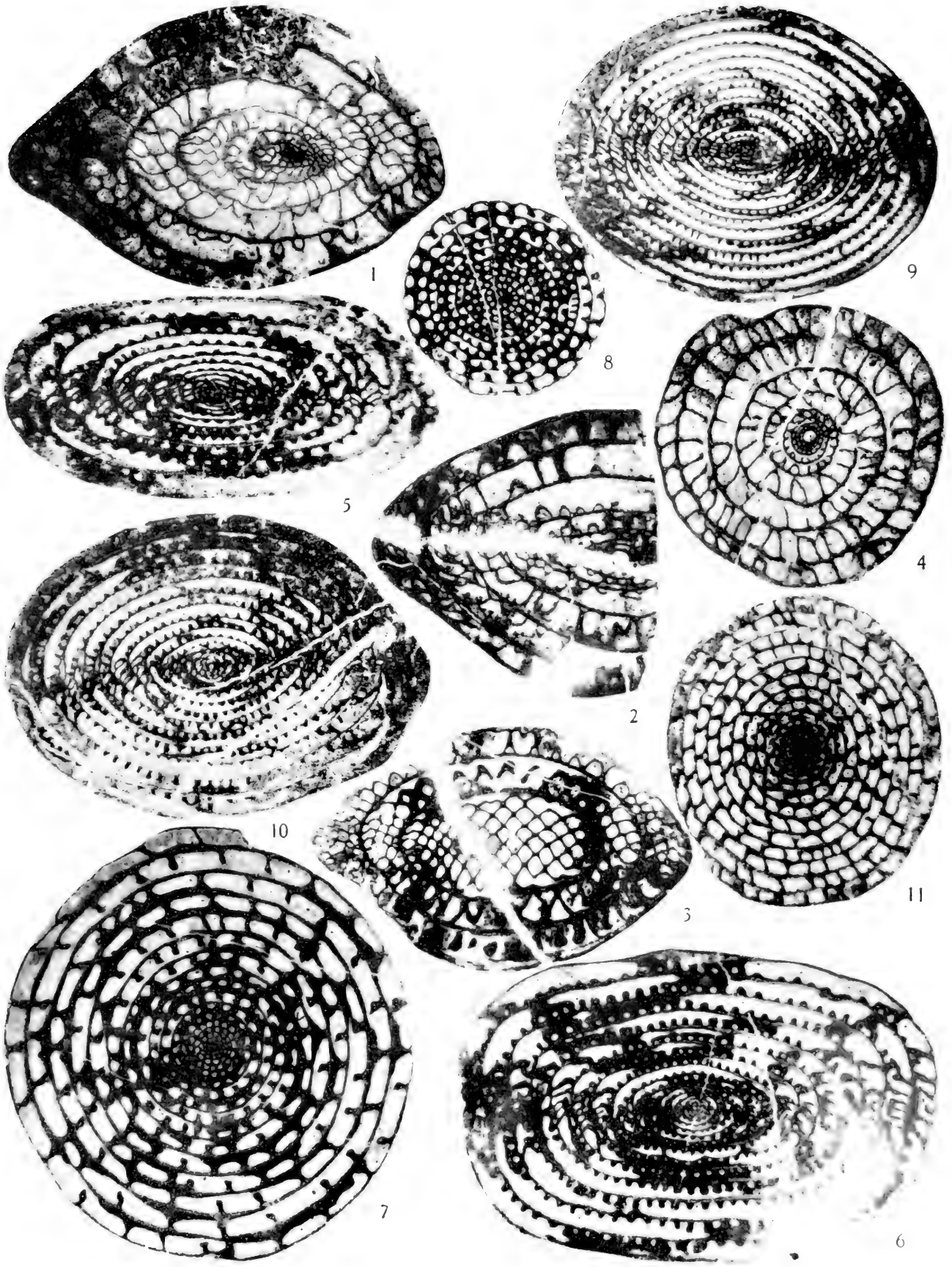
圖版 V (PLATE V)

- 1-3. *Schwagerina mengi* (sp. nov.)  
From the Maok'ou Limestone, Ning-erh, Yunnan Province.  
雲南省寧洱縣, 茅口灰岩
1. An axial section, showing the thick spirotheca and large proloculum. × 15. (Cat. No. 6185)
2. A slightly oblique axial section. × 15. (Cat. No. 6295)
3. A somewhat oblique median section. × 15. (Cat. No. 6187)
- 4-7. *Schwagerina brevipola* (sp. nov.)
4. An axial section. Chinghsichung Limestone, Hutien, Hunan Province. × 15. (Cat. No. 4830)  
湖南省湘鄉縣壺天
5. An axial section. Chinghsichung Limestone, Hutien, Hunan Province. × 15. (Cat. No. 4832)  
湖南省湘鄉縣壺天
6. A somewhat oblique axial section. Chinghsichung Limestone, Hungshantien, Hunan Province. × 15. (Cat. No. 5470)  
湖南省湘鄉縣洪山殿
7. A median section. Chinghsichung Limestone, Hutien, Hunan Province. × 15. (Cat. No. 4789)  
湖南省湘鄉縣壺天
8. *Schwagerina multialveola* (sp. nov.)  
An axial section. Chinghsichung Limestone, Hutien, Hunan Province. × 10. (Cat. No. 4831)  
湖南省湘鄉縣壺天
9. *Schwagerina suni* (sp. nov.)  
An axial section. Chinghsichung Limestone, Hutien, Hunan Province. × 10. (Cat. No. 4790)  
湖南省湘鄉縣壺天
10. *Schwagerina chinensis* (sp. nov.)  
An incomplete axial section. Wuhsuch Limestone, Tienchiachun, Kwangchi, Hupeh Province. × 10. (Cat. No. 5445)  
湖北省廣濟縣田家鎮



圖版 VI (PLATE VI)

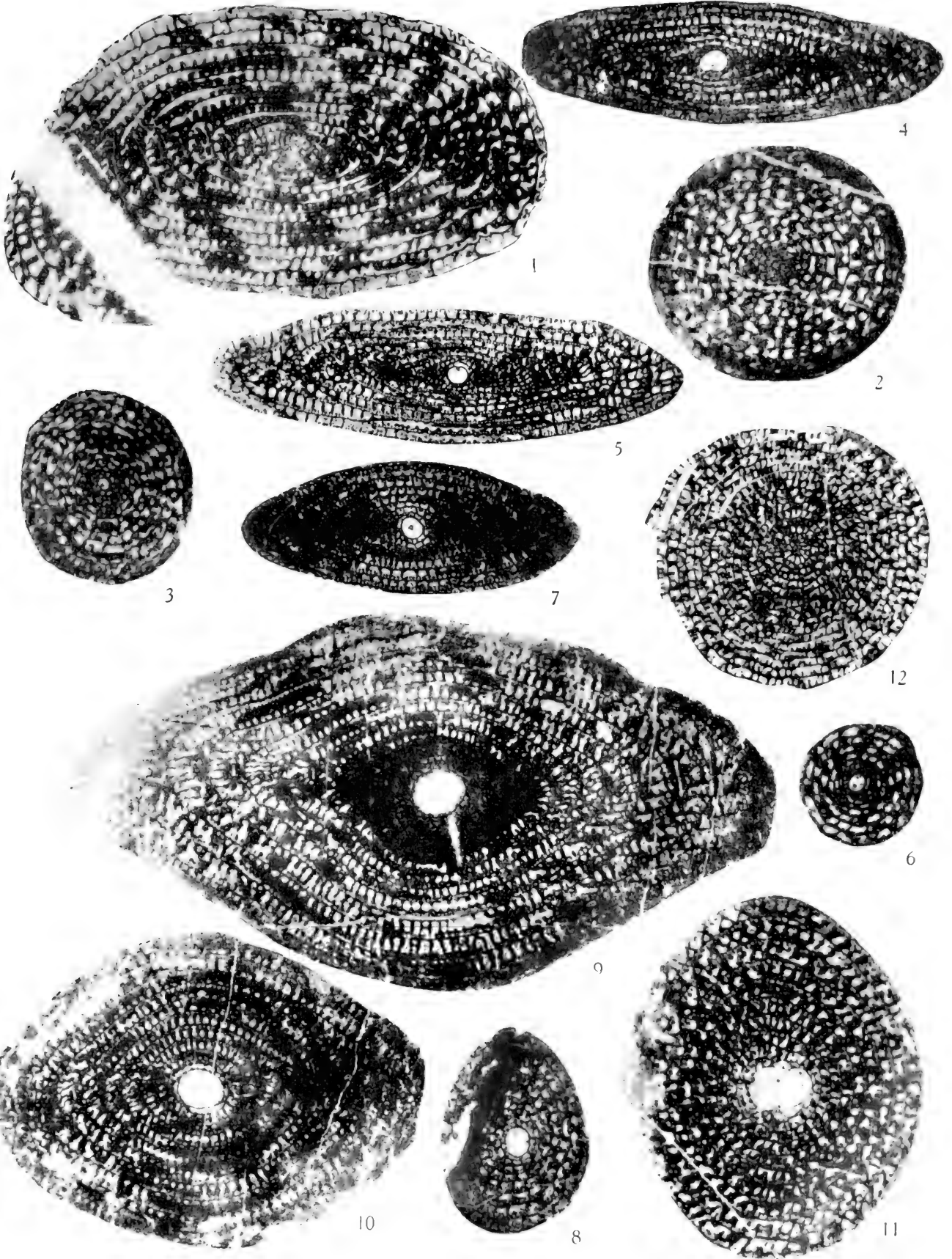
- 1-4. *Paraschwagerina shengi* Chen (sp. nov.)
1. An oblique section Chingsichung Limestone, Fengkuanshan, Hsianghsiang, Hunan Province.  $\times 12$ . (Cat. No. 1322)
  2. A portion of an axial section, Chingsuchung Limestone, Fengkuanshan, Hsianghsiang, Hunan Province.  $\times 12$ . (Cat. No. 1228)
  3. A tangential section, showing the nearly quadrate meshes of the septal network. Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  $\times 10$ . (Cat. No. 4601)
  4. A median section, Chingsichung Limestone, Fengkuanshan, Hsianghsiang, Hunan Province.  $\times 12$ . (Cat. No. 1204)
- 5-8. *Misellina lepida* (Schwager).
- 5, 8. From the Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.
  - 6, 7. From the Chingsichung Limestone, Chingsichung Hsianghsiang, Hunan Province.
  5. An axial section of a typical form.  $\times 15$ . (Cat. No. 4679)
  6. An axial section of a thick form.  $\times 15$ . (Cat. No. 1172)
  7. A median section of the thick form.  $\times 15$ . (Cat. No. 1166)
  8. A sub-median section of the typical form.  $\times 15$ . (Cat. No. 5255)
- 9-11. *Misellina major* (Deprat)
- 9, 10. Two axial sections, Chingsichung Limestone, Tungshan tien, Hsianghsiang, Hunan Province. 9,  $\times 10$ ; 10,  $\times 15$ ; (Cat Nos. 5390, 5371)
  11. A slightly eccentric median section, Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  $\times 10$ . (Cat. No. 5441)



圖版 VII (PLATE VII)

- 1-3. *Pseudodoliolina ozawai* Yabe and Hanzawa
1. An axial section of a thick form which may represent a variety. Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.  $\times 15$ . (Cat. No. 4741)
- 2, 8. Median sections.
2. from the Chingsichung Limestone, Hutien, Hsianghsiang, Hunan, Province.  $\times 15$  (Cat. No. 4739)
3. from the Maok'ou Limestone, Hochien, Kwangsi Province.  $\times 15$ . (Cat. No. 5080)
- 4-6. *Sumatrina longissima* Deprat  
From the Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.
- 4, 5. Axial sections.  $\times 15$ . (Cat. Nos. 4947, 4957)
6. Median section.  $\times 15$ . (Cat. No. 4956)
- 7, 8. *Sumatrina annae* Volz
7. Axial section. Maok'ou Limestone, Chunsan, Kwangsi Province.  $\times 15$ . (Cat. No. 5617)
8. Median section, Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.  $\times 15$ . (Cat. No. 4833)
- 9-11. *Afghanella sumatrinaeformis* Gubler  
From the Maok'ou Limestone, Ning-erh, Yunnan Province.
- 9, 10. Axial sections.  $\times 15$ . (Cat. Nos. 6185, 6273)
11. Median section.  $\times 15$ . (Cat. No. 6320)
12. *Yabcina* sp.  
A submedian section, Maok'ou Limestone, Chinkiang, Kwangsi Province.  $\times 15$ . (Cat. No. 1754)







圖版 VIII (PLATE VIII)

1-3. *Schwagerina hupehensis* (sp. nov.)

From the Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.

湖北省廣濟縣田家鎮

1. An axial section of a typical form.  $\times 15$ . (Cat. No. 4725)
2. A para-axial section of a slender form.  $\times 10$ . (Cat. No. 4724)
3. A median section.  $\times 15$ . (Cat. No. 4721)

4, 5. *Schwagerina pacticiruga* (sp. nov.)

From the Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.

湖南省湘鄉縣壺天

4. An axial section.  $\times 10$ . (Cat. No. 5221)
5. A sub-median section.  $\times 10$ . (Cat. No. 4755)

6-10. *Schwagerina granum-avenae* Roemer

From the Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.

湖北省廣濟縣田家鎮

- 6-8. Axial sections of the microspheric forms. 6, 7,  $\times 12$ ; 8,  $\times 10$ . (Cat. Nos. 4698, 4657, 4670)
9. A somewhat oblique axial section of a megalospheric form.  $\times 12$ . (Cat. No. 4702)
10. A median section of a microspheric form.  $\times 15$ . (Cat. No. 4662)

11. *Chusenella conicocylindrica* (sp. nov.)

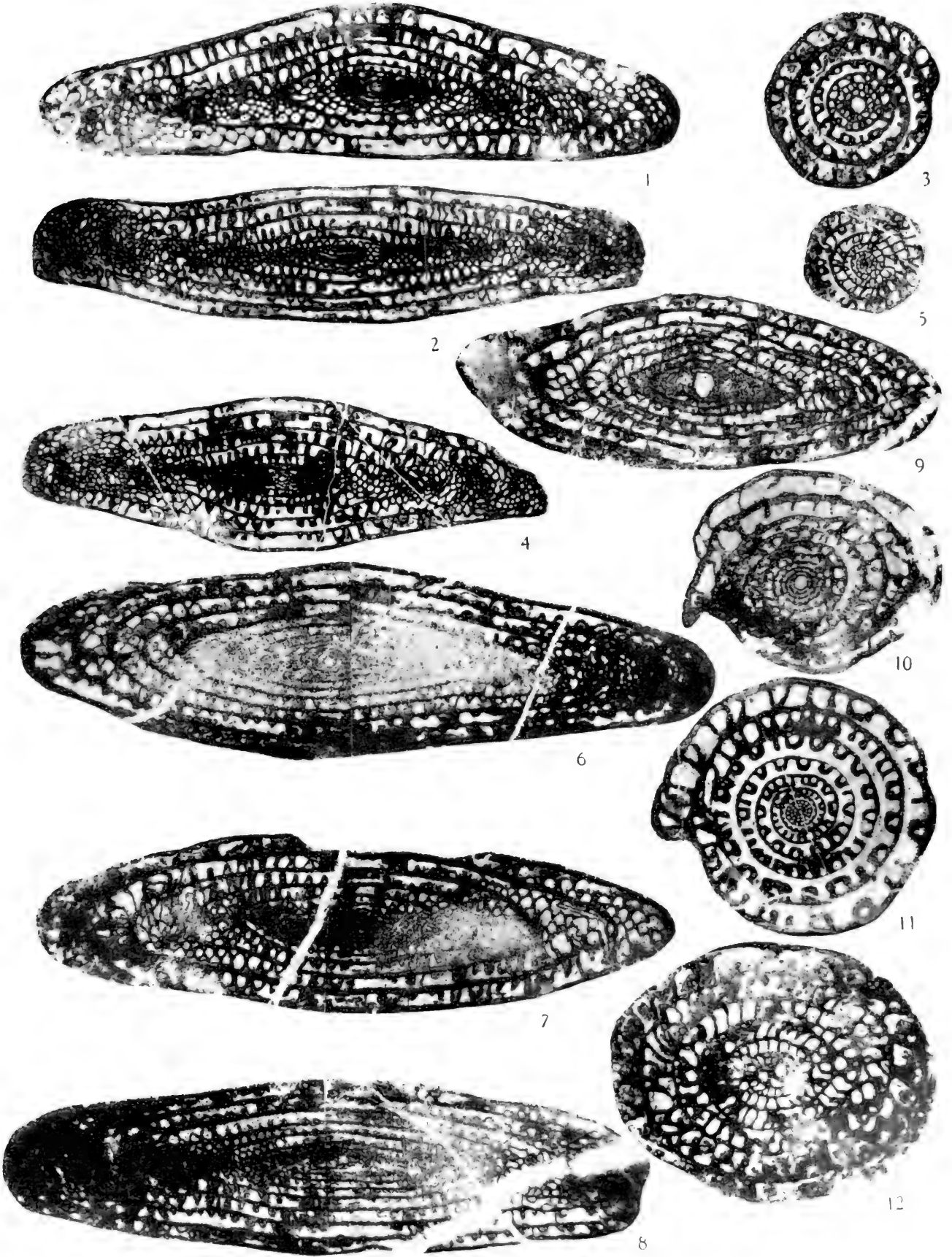
A slightly eccentric median section. Chingsichung Limestone Hutien, Hunan Province.  $\times 15$ . (Cat. No. 5464)

湖南省湘鄉縣壺天

12. *Schwagerina longitermina* (sp. nov.)

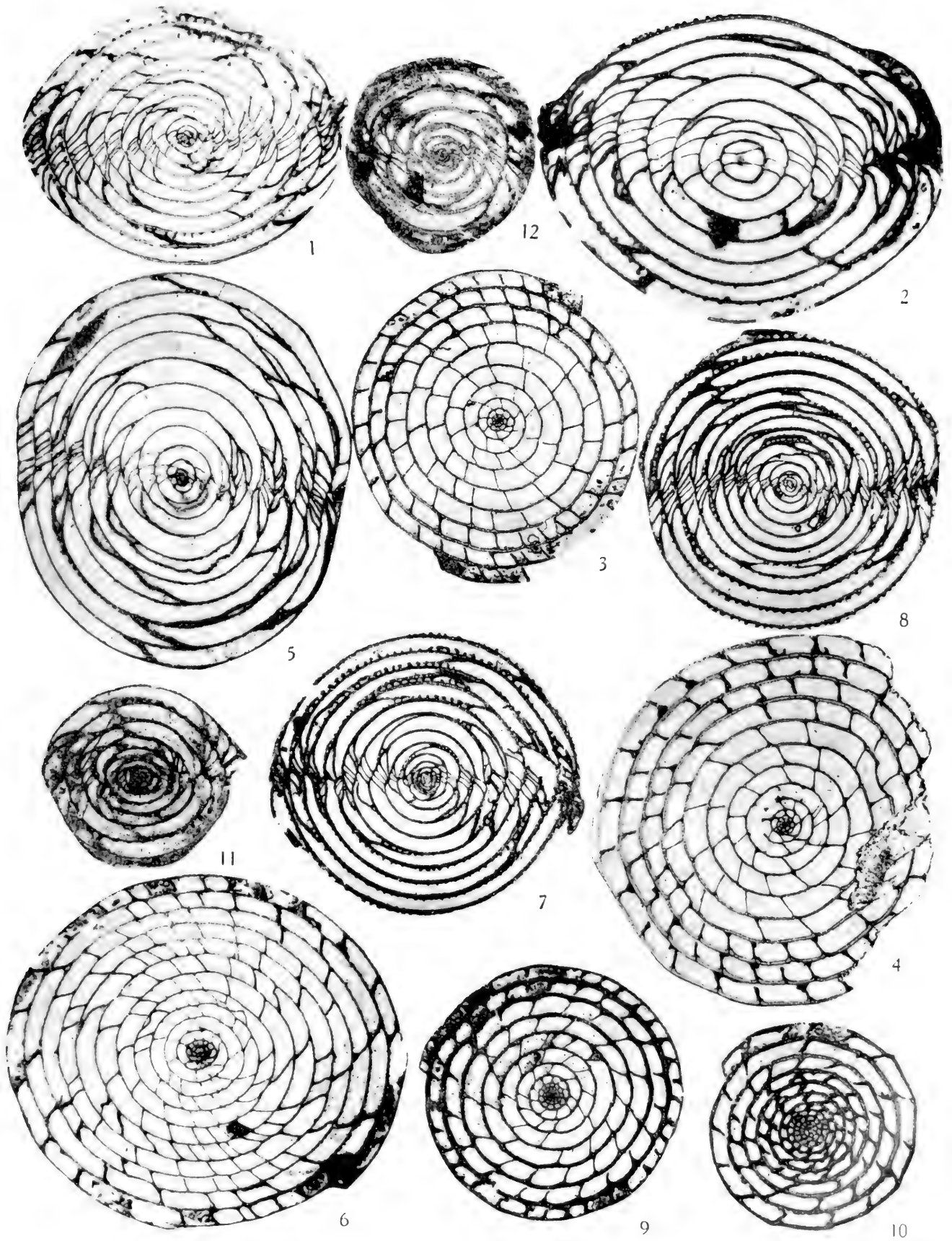
A somewhat eccentric median section. Chingsichung Limestone, Hutien, Hunan Province.  $\times 15$ . (Cat. No. 4766)

湖南省湘鄉縣壺天



圖版 IX (PLATE IX)

- 1-4. *Verbeekina ellipsoidalis* (sp. nov.)  
From the Maok'ou Limestone, Lungwangchun, Shangchin, Kwangsi Province, Z. 32.  
廣西省上金縣龍王村
1. A slightly oblique axial section.  $\times 10$ . (Cat. No. 5597)  
2. A para-axial section.  $\times 10$ . (Cat. No. 5583)  
3, 4. Median sections.  $\times 10$ . (Cat. Nos. 5593, 5596)
- 5, 6. *Verbeekina verbeeki* Geinitz  
From the Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  
湖北省廣濟縣田家鎮
5. A slightly eccentric axial section.  $\times 10$ . (Cat. No. 5263)  
6. An eccentric median section.  $\times 10$ . (Cat. No. 5484)
- 7-10. *Verbeekina crassispira* (sp. nov.)  
From the Maok'ou Limestone, Menkiang, Kwangsi Province.  
廣西省明江埭統村
- 7, 8. Axial sections.  $\times 10$ . (Cat. Nos. 5557, 5556)  
9. A median section.  $\times 10$ . (Cat. No. 5554)  
10. A median section of a tight form.  $\times 10$ . (Cat. No. 5559)
- 11, 12. *Verbeekina verbeeki sphaera* Ozawa
11. A slightly oblique axial section. Maok'ou Limestone, Lingyun, Kwangsi Province.  $\times 15$ . (Cat. No. 5306)  
廣西省凌雲
12. An axial section. Maok'ou Limestone, Shangchin, Kwangsi Province.  $\times 15$ . (Cat. No. 5637)  
廣西省上金



圖版 X (PLATE X)

1-3. *Neoschwagerina margaritae* Deprat

1. An axial section of a typical form. Chingsichung Limestone, Fengkuanshan, Hsianghsiang, Hunan Province × 15. (Cat. No. 1318)

湖南省湘鄉縣鳳冠山

2. An axial section Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province. × 15. (Cat. No. 5411)

湖南省湘鄉縣壺天

3. A median section. Maok'ou Limestone, Chama, Chinkiang, Kwangsi Province. × 15. (Cat. No. 5638)

廣西省遷江架馬

4-8. *Neoschwagerina megaspherica* Deprat

From the Maok'ou Limestone, Chinkiang, Kwangsi Province.

廣西省遷江

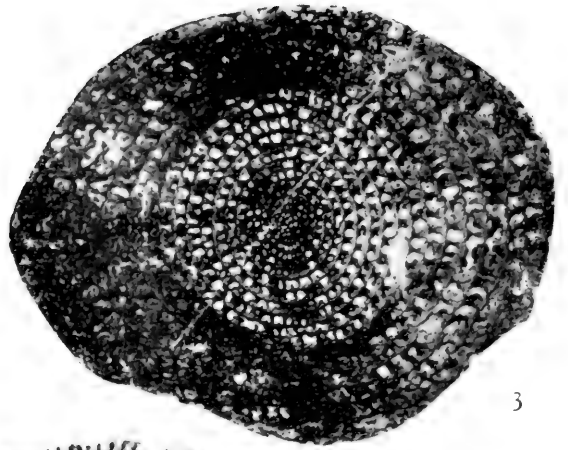
4, 5. Axial sections. × 15. (Cat. Nos. 1791, 1811)

6. Slightly oblique section. × 15. (Cat. No. 6544)

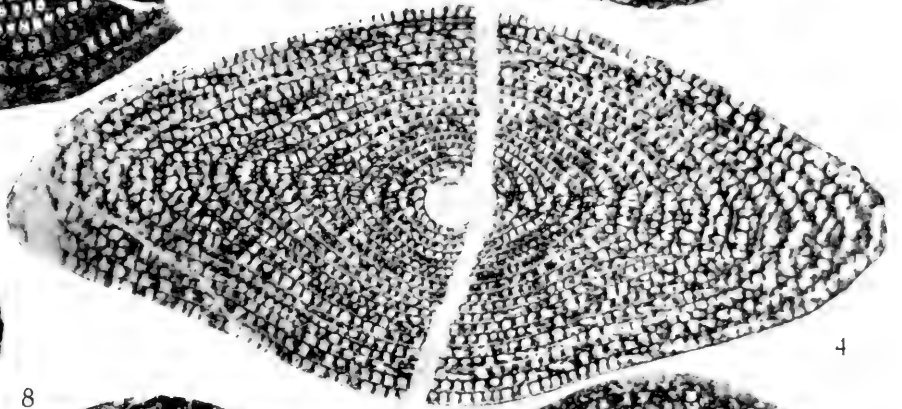
7, 8. Median sections. × 15. (Cat. Nos. 6543, 6538)



1



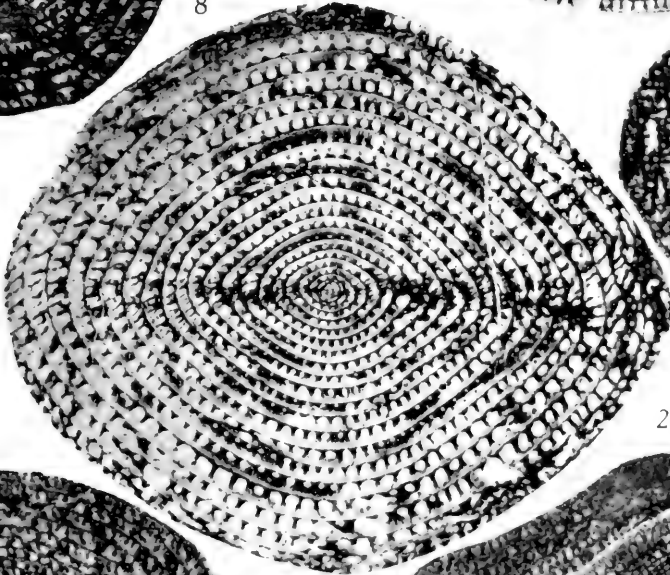
3



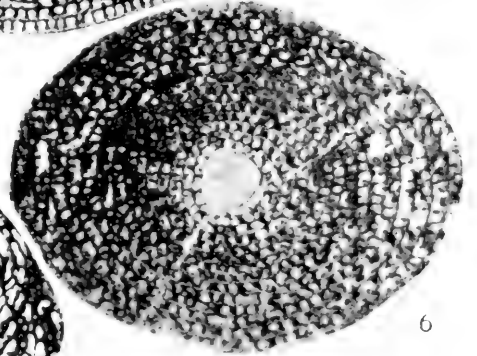
4



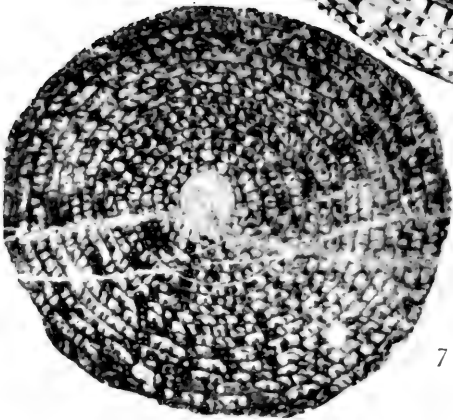
8



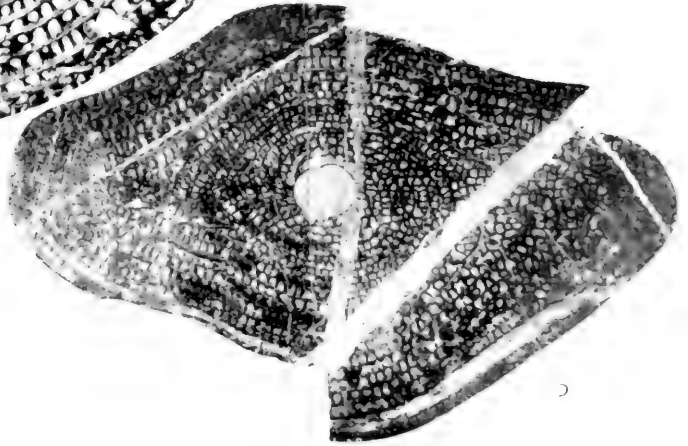
2



6



7



5

圖版 XI (PLATE XI)

1-6. *Ncoschwagerina leei* (sp. nov.)

1-4. Axial sections, showing the extremely thin spiral septula. Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province, 1-3,  $\times 12$ ; 4,  $\times 15$ . (Cat. Nos. 5406, 5405, 5404, 5401)

湖南省湘鄉縣壺天

5, 6. Median sections. In the Chingsichung Limestone. 5 from Hutien, 6 from Hungshantien, Hunan Province.  $\times 15$ . (Cat. Nos. 5407, 5392)

湖南省湘鄉縣壺天及洪山殿

7, 8. *Yabeina inouyei* Deprat

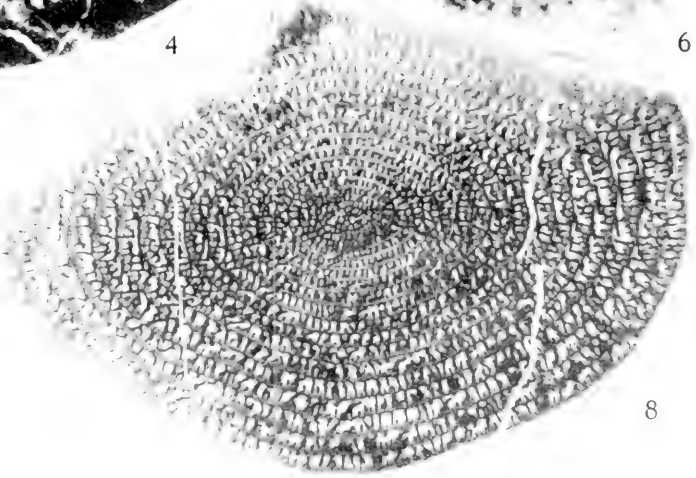
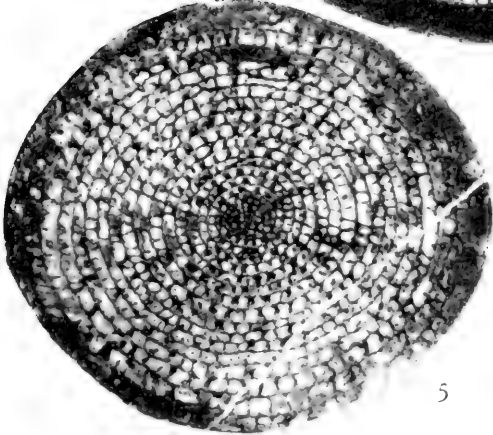
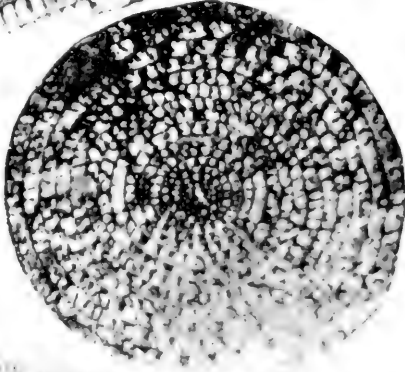
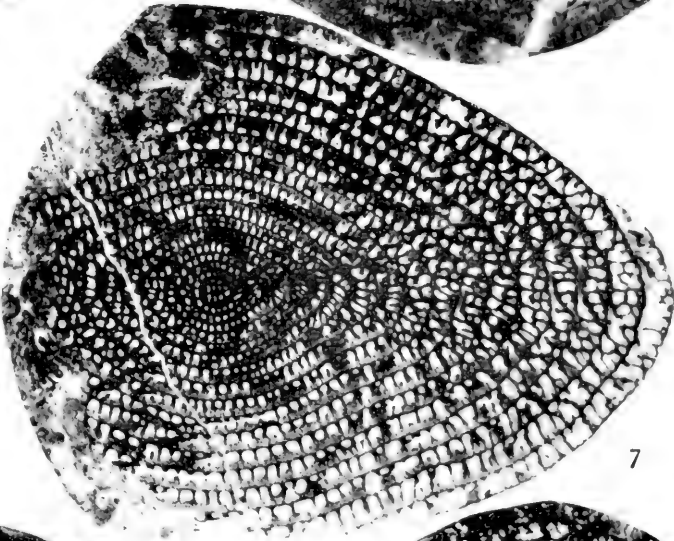
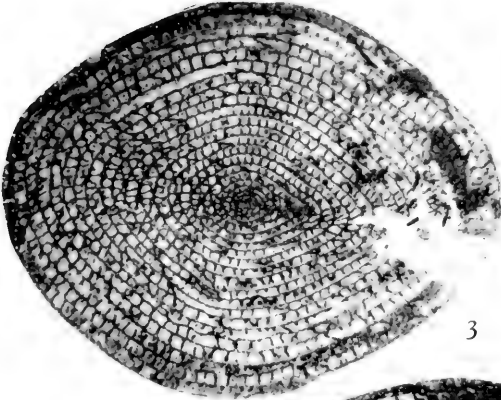
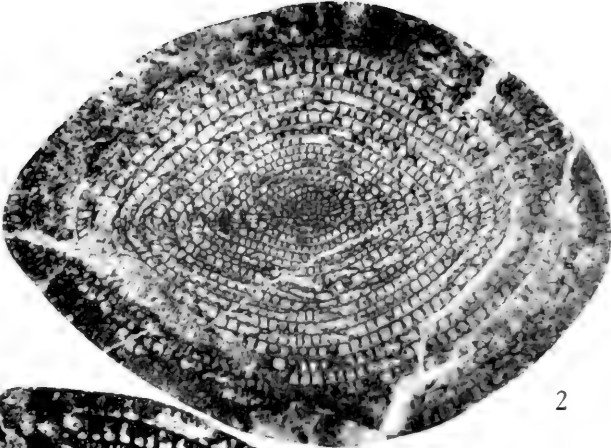
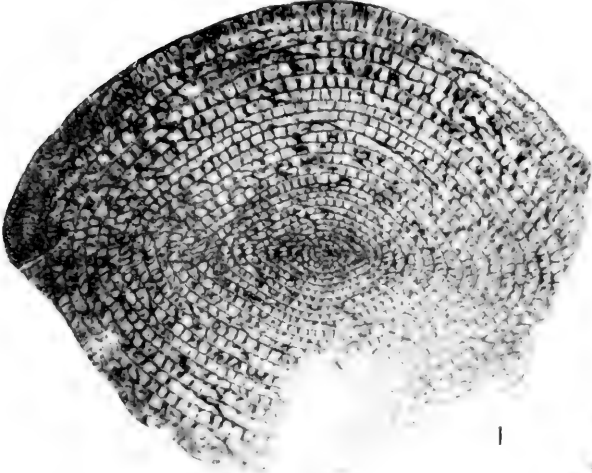
From the Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.

湖南省湘鄉縣壺天

7. A *para*-axial section.  $\times 15$ . (Cat. No. 4834)

8. An axial section.  $\times 10$ . (Cat. No. 5522)





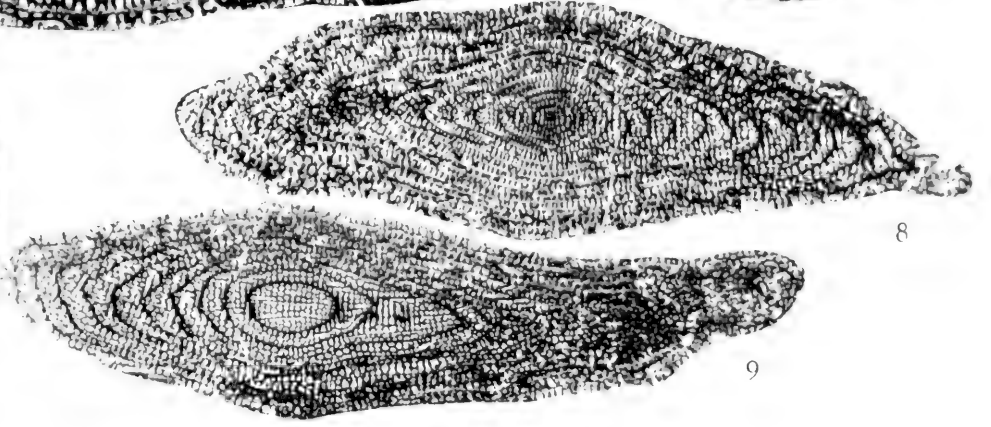
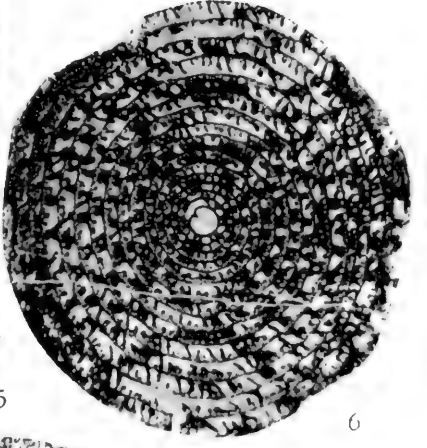
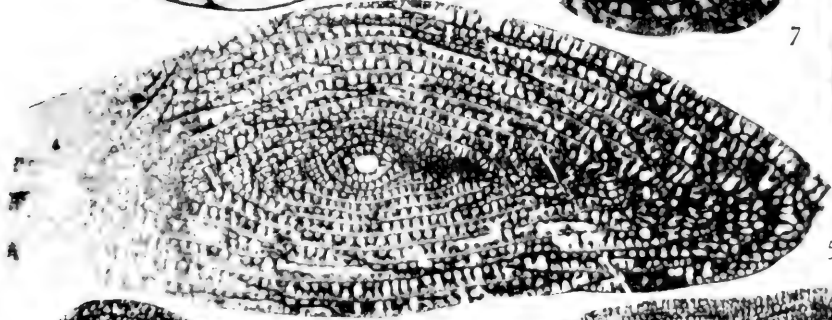
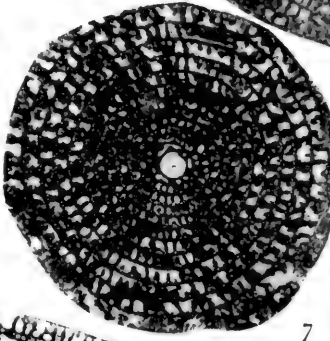
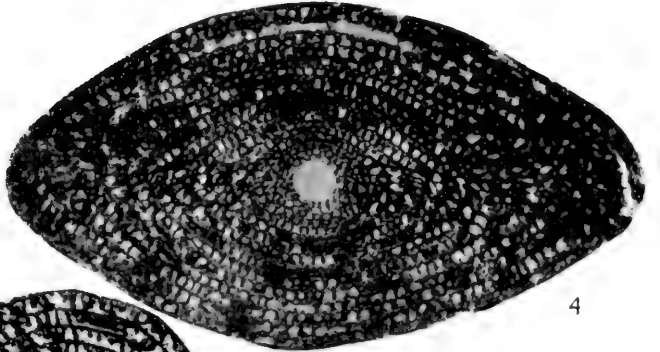
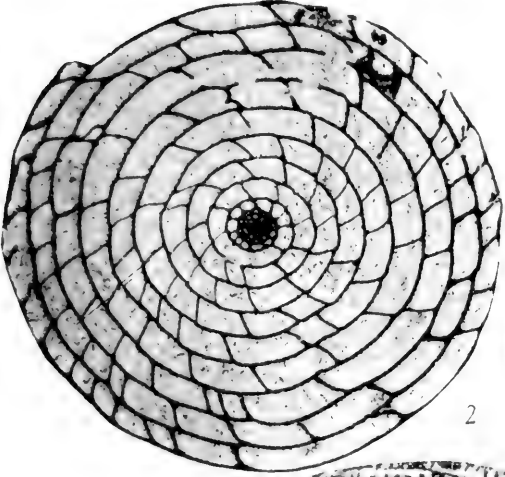
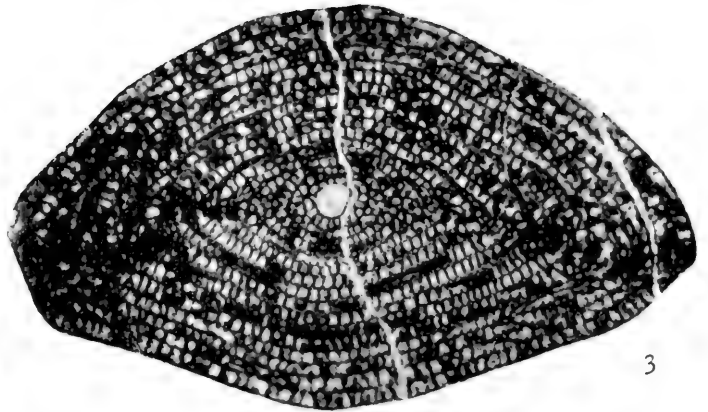
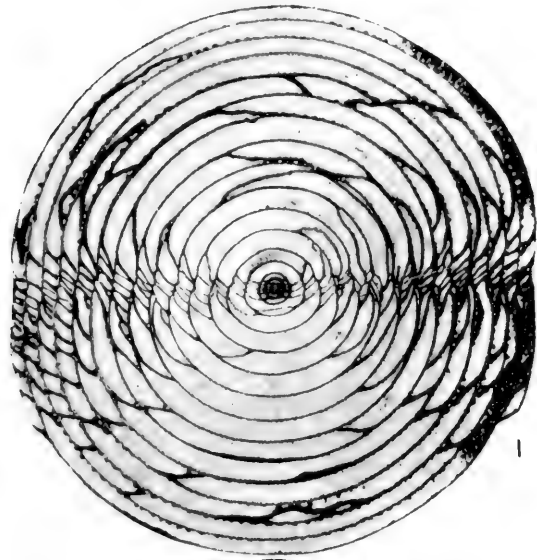
圖版 XII (PLATE XII)

- 1-3. *Cancellina schellwieni* Deprat  
All from the Maok'ou Limestone, Lingyun, Kwangsi Province.  
廣西省凌雲, 茅口灰岩
- 1, 2. Axial sections. × 15. (Cat. Nos. 5314, 5312)
3. Median section. × 15. (Cat. No. 5312)
- 4-9. *Afghanella schencki* Thompson
4. An axial section. Maok'ou Limestone, Shangchin, Kwangsi Province. × 15. (Cat. No. 5606)  
廣西省上金縣天西圩
5. An axial section. The transverse septula well developed. Maok'ou Limestone, Shangchin, Kwangsi Province. × 15. (Cat. No. 5604)  
廣西省上金縣龍王村
6. A median section with a large proloculum, Maok'ou Limestone, Chungsan, Kwangsi Province. × 15. (Cat. No. 5087)  
廣西省崇善縣板利圩
- 7, 8. Median sections, Maok'ou Limestone, Shangchin, Kwangsi Province. × 15. (Cat. Nos. 5587, 5586)  
廣西省上金縣龍王村
9. An axial section. Whorls numerous, Transverse septula well developed, Maok'ou Limestone, Chungsan, Kwangsi Province. × 15. (Cat. No. 5609)  
廣西省崇善縣新村
- 10-12. *Neoschwagerina craticulifera* Schwager
- 10, 11. Two axial sections, Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province. × 15. (Cat. Nos. 4971, 4972)  
湖南省湘鄉縣壺天, 清溪冲灰岩
12. A slightly eccentric median section. Chingsichung Limestone, Hutien, Hunan Province. × 15. (Cat. No. 4966)  
湖南省湘鄉縣壺天
- 13-16. *Neoschwagerina simplex* Ozawa
13. An axial section of a slender form. Maok'ou Limestone, Suilü, Kwangsi Province. × 15. (Cat. No. 5304)  
廣西省綏緣縣上屯圩
14. A slightly oblique axial section of a typical form, showing the very thick spirotheca. Maok'ou Limestone, Shangchin, Kwangsi Province. × 15. (Cat. No. 5623)  
廣西省上金
15. A median section cut at a small distance from the centre of the proloculum, Maok'ou Limestone, Shangchin, Kwangsi Province. × 15. (Cat. No. 5624)  
廣西省上金
16. A median section of a slender form. Maok'ou Limestone, Chungsan, Kwangsi Province. × 15. (Cat. No. 5330)  
廣西省崇善縣板利圩



圖版 XIII (PLATE XIII)

- 1, 2. *Verbeekina verbeeki* Geinitz
1. A slightly eccentric axial section, Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  $\times 8$ . (Cat. No. 5495)  
湖北省廣濟縣田家鎮
2. Median section. Locality same as 1.  $\times 10$ . (Cat. No. 5550)  
湖北省廣濟縣田家鎮
- 3, 4. Axial sections. Maok'ou Limestone, Chinkiang, Kwangsi Province.  $\times 15$ . (Cat. Nos. 1760, 5221)
- 3-7. *Neoschwagerina douvillei* Ozawa
- 3, 4. Axial sections. Maok'ou Limestone, Chinkiang, Kwangsi Province.  $\times 15$ . (Cat. Nos. 1760, 5221)  
廣西省遷江
5. An axial section of an elongate form. Wuhsueh Limestone, Tienchiachun, Kwangchi, Hupeh Province.  $\times 15$ . (Cat. No. 5276)  
湖北省廣濟縣田家鎮
- 6, 7. Median sections. Maok'ou Limestone, Chinkiang, Kwangsi Province.  $\times 15$ . (Cat. Nos. 5639, 5642)  
廣西省遷江
- 8-10. *Yabeina proboscis* (sp. nov.)  
From the Maok'ou Limestone, Chinkiang, Kwangsi Province.
- 8, 9. Para-axial sections.  $\times 10$ . (Cat. Nos. 5158, 5156)
10. A median section.  $\times 10$ . (Cat. No. 5151)



1

3

2

4

7

5

6

10

9

8

圖版 XIV (PLATE XIV)

1-4. *Neoschwagerina colaniae* Ozawa

1. Axial section, Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.  $\times 15$ . (Cat. No. 4873)

湖南省湘鄉縣壺天

2. An axial section. In the same limestone as 1. Hungshantien, Hsianghsiang, Hunan Province.  $\times 15$ . (Cat. No. 5388)

湖南省湘鄉縣洪山殿

3. A somewhat diagonal section. Locality same as 1.  $\times 15$ . (Cat. No. 4876)

4. A median section. Locality same as 1.  $\times 15$ . (Cat. No. 4877)

5, 6. *Neoschwagerina multicircumvoluta* Deprat

From the Chingsichung Limestone, Hutien, Hunan Province.

湖南省湘鄉縣壺天

5. A slightly diagonal axial section.  $\times 15$ . (Cat. No. 5037)

6. A sub-median section.  $\times 15$ . (Cat. No. 5037)

7. *Neoschwagerina douvillei* Ozawa

A median section, Wuhsueh Limestone, Tienchiachun, Kwangchi Province, Hupeh.  $\times 15$ . (Cat. No. 5549)

湖北省廣濟縣田家鎮

8-10. *Yabeina shiraiwensis* Ozawa

From the lower part of the Chingsichung Limestone, Hutien, Hsianghsiang, Hunan Province.

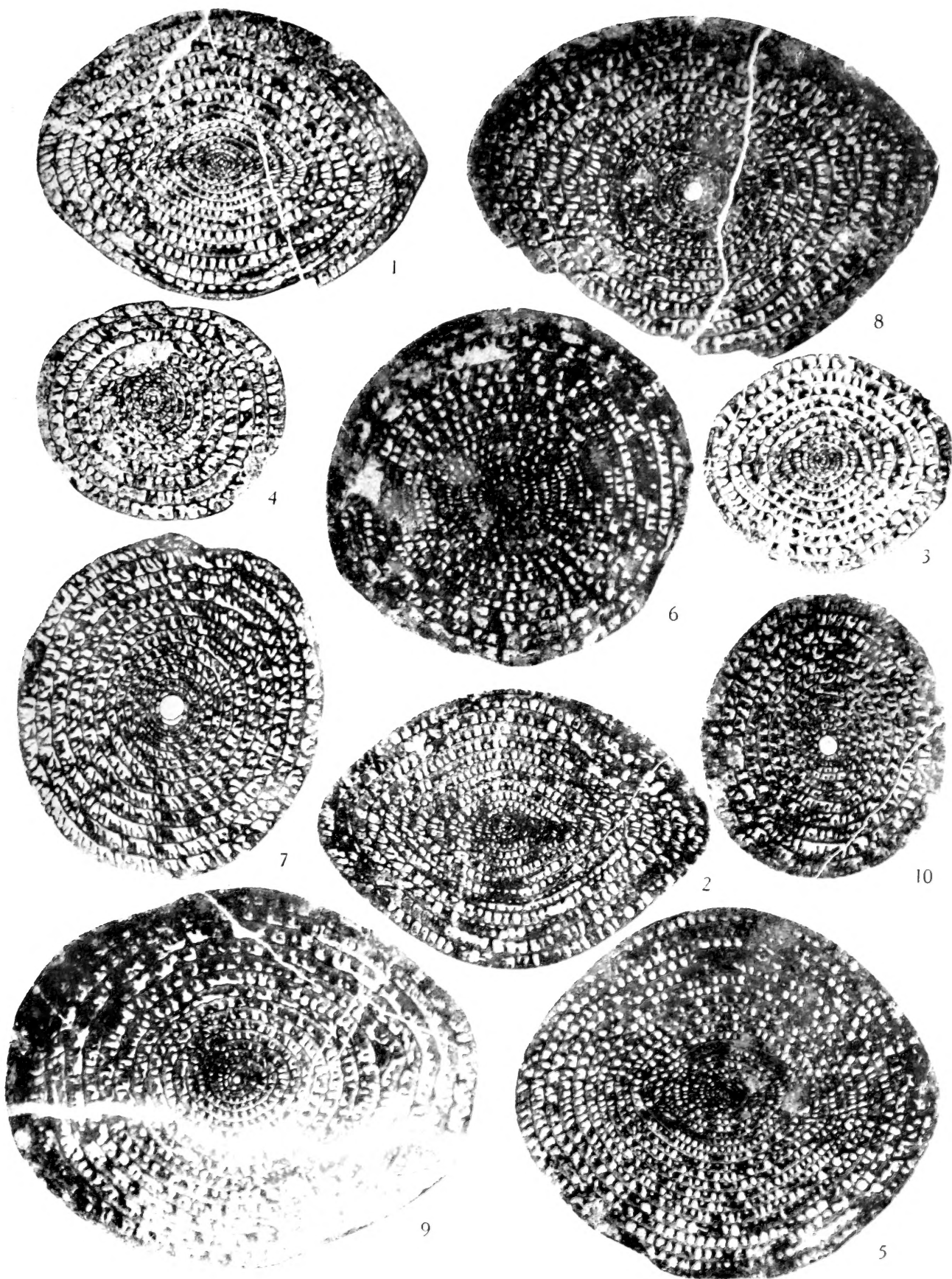
湖南省湘鄉縣壺天

8. A diagonal section.  $\times 15$ . (Cat. No. 4807)

9. A slightly eccentric median section.  $\times 15$ . (Cat. No. 4788)

10. A median section.  $\times 15$ . (Cat. No. 4835)





中科院植物所图书馆



S0022166



299 BG 288  
中国古生植物志  
陈旭  
58.31736  
287  
~~58.31736~~

58.31736

287

書號 .....

299

登記號 BG 288 .....

65

65

65