

南京幕府山寒武纪三叶虫*

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1959 年夏,南京大学地质系师生,在南京北郊幕府山,过去认为是早奥陶世的“仑山灰岩”中,首次采获寒武纪三叶虫,并由俞剑华、陈敏娟、张茂深等同志进行详细分层,发表“南京幕府山区寒武纪地层的发现”一文。除原采的三叶虫标本外,笔者及中国科学院地质古生物研究所的同志们,曾数次前往作补充采集。本文所记载的,即包括这几次采集的材料。

为了便于明瞭三叶虫的层位,兹将俞剑华等所作剖面附录于此:

上覆地层——中奥陶世宝塔组——泥质石灰岩产 *Sinoceras*, *Vaginoceras* 等化石。

—————断层接触—————

中寒武统炮台山组 (ϵ_2)

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| 33. 浅灰白色带红的块状白云质灰岩,含多量的燧石结核。 | 15.20 米 |
| 32. 浅灰色至灰黑色薄层白云质灰岩,含少量的燧石结核。 | 7.30 米 |
| 31. 浅灰色薄层白云质石灰岩,具角砾状构造,风化后表面成碎屑物。 | 45.70 米 |
| 30. 浅红色薄层白云岩,单层厚度 1—3 厘米。 | 6.69 米 |
| 29. 浅红色泥质石灰岩,风化后呈黄色。 | 3.75 米 |
| 28. 浅红色薄层白云岩,性坚硬。 | 6.40 米 |
| 27. 浮土覆盖。 | 3.90 米 |
| 26. 微带红色白云岩,风化后表面呈灰白色。 | 3.56 米 |
| 25. 灰色至灰黑色白云岩。 | 15.90 米 |
| 24. 黄色薄层泥质石灰岩,质疏松,富产三叶虫 <i>Probowmania</i> (<i>Mufushania</i>) <i>nankingensis</i> Lin (新亚属,新种), <i>Probowmania</i> (<i>Mufushania</i>) <i>changi</i> Lin (新亚属,新种)等。 | 0.93 米 |
| 23. 紫红色泥质灰岩,风化后呈黄色。 | 3.38 米 |
| 22. 灰黑色薄层石灰岩。 | 2.70 米 |
| 21. 浅灰色白云质石灰岩。 | 12.10 米 |
| 20. 灰白色至灰褐色薄层白云岩,风化后质疏松,底部有角砾岩及发育不好的竹叶状白云质灰岩,同时具有厚 1 米左右的豆状白云质灰岩。 | 44.90 米 |
| 19. 砾岩层,砾石为灰黑色,钙质,一般为圆形,直径在 3—8 毫米之间。 | 1.90 米 |

—————假 整 合—————

下寒武统幕府山组 (ϵ_1)

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| 18. 灰黑色薄层含胶磷矿结晶白云质石灰岩。 | 8.40 米 |
| 17. 浅紫红色白云质石灰岩,含磷,富产三叶虫 <i>Paokannia</i> sp., <i>Redlichia</i> 及腕足类化石的碎片。 | 2.25 米 |

* 1964 年 4 月 28 日收到。

16. 紫红色钙质页岩, 含磷。	0.60 米
15. 灰白色至灰黑色薄层石灰岩, 中夹黄褐色钙质页岩。	1.51 米
14. 灰白色薄层含胶磷矿结晶白云质石灰岩。	1.68 米
13. 灰白色白云质石灰岩。	2.25 米
12. 浅紫红色薄层白云岩。	5.75 米
11. 灰褐色薄层致密白云岩, 夹含白云质砂质页岩。	7.00 米
10. 灰白色较纯石灰岩, 含少量燧石结核, 亦见燧石层。	40.00 米
9. 灰黑色薄层石灰岩, 含磷, 底部夹有钙质页岩。	2.70 米
8. 浅褐色板状页岩, 含有云母, 风化后呈黄褐色。	4.50 米
7. 灰褐色硅质页岩与板状页岩互层, 风化后呈紫红色或黄褐色。	8.00 米
6. 黑色炭质页岩, 含石煤层, 磷质结核以及少量的黄铁矿结核。	24.00 米
5. 黑色炭质页岩。	17.80 米
4. 黑色炭质页岩及黑色硅质页岩。	31.60 米
3. 灰黑色页岩, 风化后呈灰白色。	6.90 米
2. 浮土覆盖。	4.20 米
1. 灰黄色砂质页岩。	11.90 米

-----假 整 合-----

下伏地层——震旦系灯影组——灰白色块状白云质石灰岩, 含燧石结核。

幕府山组所产的三叶虫, 与华中早寒武世中期的分子很相似。在湖北保康县曾发现 *Paokannia chinensis* 与 *Redlichia* 和 *Palaeolenus*(?) 共生(何心一, 李晋僧 1959; 卢衍豪 1962)。而 *Palaeolenus* 属则是华中、西南早寒武世滄浪鋪組的一个带化石。据近年来的报导, 該属也广泛分布在华北和东北的南部以及朝鮮的南部(小林貞一 1961; 朱兆玲 1962; 卢衍豪 1963)。因此, 南京所发现的 *Paokannia*, 也是早寒武世中期(滄浪鋪期)的产物。这也說明了, 在这个时期下扬子区不仅受过海侵, 并且在西部与华中、西南, 在北部与中朝海侵区是相互沟通的。

本文是在陈旭教授和张文堂教授热情鼓励和亲切指导下完成的, 并詳細审閱和修改原稿; 卢衍豪教授也在百忙中审閱及修改文稿, 俞剑华老师也提出宝贵意見; 錢义元同志在本文写作过程中給予大力协助, 笔者均致以衷心的感谢。

种 屬 描 述

萊得利基虫目 *Redlichiida* Richter, 1933

萊得利基虫超科 *Redlichiacea* Poulsen, 1927

新萊得利基虫科 *Neoredlichiidae* Hupé, 1953

保康虫属 *Paokannia* Ho et Lee, 1959

Paokannia sp.

(图版 I, 图 1—5)

材料: 不完全头盖一个和几个尾部。

描述: 头鞍长, 呈亚截錐状, 前端渾圓, 向前显著的变狭, 背沟浅。具三对明显的头鞍沟, 第一对短而浅, 近于水平, 第二、第三两对长而深, 横穿头鞍, 并稍向后傾斜。頸沟向后

弯曲,内边缘缺失,外边缘宽而凸,向前倾斜。固定颊狭而凸。没有眼脊。

尾部成长的三角形,长度与宽度之比为 1.4:1。轴部长,甚凸,呈圆柱状,后部略膨大,后端浑圆,伸出边缘,分节达 15 节左右,在前面各轴节宽且显著,向后渐变狭,至不清楚,最后一节特大。肋部比轴部宽,分节大致与轴节一致。同样前部分节清楚,向后肋沟愈浅至消失。前部边缘从肋节末端延伸成细长的刺,后部具极狭的边缘。

比较: 当前标本与 *Paokannia chinensis* Ho et Lee 很相似,不同的是尾部分节多,轴部呈圆柱状,并在后面略膨大,后面边缘成狭脊。可能为一新种。

时代: 早寒武世。

标本登记号: T001, T002a—b, T003, T004, T005。

褶颊虫目 Ptychopariida Swinnerton, 1915

褶颊虫科 Ptychopariidae Matthew, 1887

原波曼虫亚科 Probowmaniinae Chang, 1963

原波曼虫属 *Probowmania* Kobayashi, 1935

幕府山虫亚属 *Mufushania* Lin

特征: 背壳呈椭圆形。头部半圆形,略凸。头鞍呈长锥状,凸度较大,前缘浑圆,具三对头鞍沟。颈沟宽而浅。颈环呈半椭圆形,具颈疣。两侧背沟深而宽,但在头鞍前面的背沟很浅。内边缘与外边缘等宽。外边缘平或略凸,其宽度较均一。前缘浑圆。眼叶大小中等,位于头盖长度的中间偏后。眼脊清晰,斜伸至头鞍的前侧角,但与边缘沟近平行。固定颊凸,其宽度与头鞍近似或稍狭。后侧翼狭而长,后边缘沟明显。面线前支从眼叶前缘向外伸出,后支向后向外斜伸。活动颊宽度与固定颊近等大。侧外边缘平,向后延伸成粗短的颊刺。

胸部由 14 节组成。轴部宽度略小于肋部。

尾部小,呈半椭圆形。中轴短,最少可分二节。但肋部分节不明。边缘明显。

亚属型: *Probowmania* (*Mufushania*) *nankingensis* Lin

讨论: 新亚属与 *Probowmania* Kobayashi, 1935 的属型 *P. ligea* (Walcott) 很相似,所不同的是前者的头鞍沟较长;外边缘稍宽而平;眼叶也较长,位于头盖长度中间的偏后方。与 *Probowmaniella* Chang, 1963 不同之处,在于后者没有头鞍沟,头鞍呈切锥形。它与 *Proasaphiscus* (*Kütsingocephalus*) Lee et Wang, 1963 也很相似,但本亚属胸部由 14 节组成,头鞍沟显著,尾部小,而后者胸部只有 12 节,头鞍沟微弱或不清楚,尾部较大、可以区别。新亚属不同于 *Shantungaspis* Chang, 1957 处在于后者头鞍成截锥形,颈环中部有一颈刺,内边缘及外边缘均较凸,前边缘沟深。

时代: 中寒武世。

南京幕府山虫 *Probowmania* (*Mufushania*) *nankingensis* Lin, (新种)

(图版 1, 图 6—11)

材料: 完整背壳一块,头部 5 块及许多不完整的胸节。

描述: 背壳呈椭圆形。头部半圆形,略凸,其长度占背壳长的 1/3。头鞍锥状而长,凸

度較大,前緣渾圓。三对头鞍沟,前二对不甚明显,最后一对較长且向后傾斜,向軸端具分叉現象。頸沟寬而浅,尤其中間部分更浅。頸环呈半橢圓形,向后凸出,具頸疣。背沟深而寬,在其前端呈坑状,但在头鞍前面的背沟浅。內边緣与外边緣等寬,微凸。外边緣平,其寬度較均一。前緣渾圓。眼叶大小中等,其长度約为头鞍长度的一半,位于头盖长度的中間偏后,眼脊清晰,斜伸至头鞍前側角,但与边緣沟近平行。固定頰凸,其寬度与头鞍近似或稍狹,近背沟呈急斜,后側翼狹而长。后边緣沟深而寬,后边緣狹而凸,其寬度約小于頸环。面綫前支从眼叶前端向外伸出,約与头盖中軸綫呈 30° — 40° 交角;后支从眼叶后端向后向外斜伸。活动頰寬度与固定頰等大,側边緣平,向后延伸呈短粗的頰刺。

胸部由 14 节組成。軸部寬略小于肋部,向后逐漸变狹,凸度較大。背沟深而寬。肋部中間拱起,肋沟寬而浅,稍向外向后斜伸,肋刺短。

尾部小,呈半橢圓形,軸部呈短圓柱形,向后伸近边緣,后緣渾圓,最少可分二节。背沟浅。肋部平,分节不明,边緣明显,并向下傾斜。

标本登記号: T006, T007, T008 (正型标本), T009a—b, T010, T011。

张氏幕府山虫 *Probowmania (Mufushania) changi* Lin, (新种)

(图版 1, 图 12—17)

材料: 头盖 6 块。

描述: 头盖亚梯形。头鞍凸度中等,呈錐状,前端略渾圓,长度稍大于头盖的 $1/2$, 三对側头鞍沟甚显著,第一对短而平伸,第二对略向后傾斜,第三对长而強烈向后斜伸,几近頸沟,向軸端呈两分叉。頸沟狹而深。頸环中間寬,呈半橢圓形,中間具一小疣。兩側背沟較鞍前沟深。內边緣与外边緣寬度近似,微凸。前边緣沟寬而浅。外边緣略拱起,中間寬而兩側狹。眼叶长,約近头鞍长度的 $1/2$, 位于头盖兩側长度的中間略偏后。眼沟較深。眼脊显著,从眼叶前端至头鞍前側角伸出。固定頰比头鞍中間的寬度略小。后側翼狹而长。后边緣沟深而寬,近頸环处后边緣寬度很狹。面綫前支从眼叶前端向外伸出,約与中軸綫呈 30° 交角;后支短,从眼叶后端向后向外斜伸。

比較: 本种与 *Probowmania (Mufushania) nanjingensis* Lin 很相似,但本种头盖較寬;外边緣狹而向上拱起,与后者可以区别。

标本登記号: T012, T013, T014, T015, T016 (正型标本), T017。

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A CAMBRIAN TRILOBITE FAUNA FROM MUFUSHAN, NANKING

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(Summary)

The trilobites described in this paper were collected from the Lower and Middle Cambrian at Mufushan, Nanking, by the writer and the others under the guidance of Mr. X. H. Yu in 1959 and by the members of the Institute of Geology and Palaeontology, Academia Sinica in 1962. Two genera consisting of three species, namely, *Paokannia* sp., *Probowmania* (*Mufushania*) *nankingensis* (subgen. et sp. nov.) and *P.* (*Mufushania*) *changi* (subgen. et sp. nov.) are recognized. Among them one subgenus and two species are new.

DESCRIPTION OF SPECIES

Family Neoredlichiidae Hupé, 1953

Genus *Paokannia* Ho et Lee, 1959

Paokannia sp.

(Pl. I, figs. 1—5)

Material: Only one incomplete cranidium and several pygidia.

Description: Glabella elongated, truncato-conical, rounded in front, tapering rapidly forwards. Dorsal furrows shallow. Three pairs of conspicuous glabellar furrows: anterior pair short and shallow, nearly horizontal; second and posterior pairs long and deep, running obliquely backwards and meeting at the middle. Occipital furrow slightly arched backwards. Preglabellar field absent. Anterior border broad and convex, arched forwards. Fixed cheeks narrow and convex. Ocular ridges absent.

Pygidium elongatedly triangular in outline, with a proportion of the length and the width about 1.4:1. Axial lobe narrow, long and strongly convex, subcylindrical in outline, segmented into about 15 axial rings which become narrower backwards with terminal piece especially large. Posterior end rounded, and slightly protruding beyond the margin. Pleural lobe a little broader than the axial lobe; pleural furrows very deep, broad in anterior part and very shallow in posterior part of the pleural lobes. Anterior ribs with slender and long spines; posterior border very narrow.

Comparison: This species is closely related to the genotype, *Paokannia chinensis* Ho et Lee, 1959, but differs from the latter in the number of pygidial segments, in the cylindrical and slightly backward extended pygidial axis and in the narrow border of the pygidium.

Horizon: Lower Cambrian.

Cat. Nos. T001, T002a—b, T003, T004, T005.

Family Ptychopariidae Matthew, 1887**Subfamily Probowmaniinae Chang, 1963****Genus *Probowmania* Kobayashi, 1935****Subgenus *Mufushania* Lin (subgen. nov.)**

Diagnosis: Dorsal shield oval in outline. Cephalon semicircular, slightly convex. Glabella conical, long, convex and slightly rounded in front. Three pairs of lateral glabellar furrows. Occipital furrow shallow. Occipital ring semi-elliptical in outline, with an occipital node. Dorsal furrows deep and broad, preglabellar furrow very shallow. Brim as wide as border. Border flat or slightly convex, almost uniform in width. Anterior margin rounded. Palpebral lobes of moderate size and located slightly behind the middle length of the cranidium. Eye ridges distinct, stretching obliquely to the antero-lateral corner of the glabella, subparallel to anterior marginal furrows. Fixed cheek convex, nearly as wide as, or slightly narrower than, the width of glabella between the palpebral lobes. Postero-lateral limb narrow and long. Posterior border furrows distinct. Anterior section of the facial suture obliquely stretching outwards from the anterior end of the palpebral lobe, posterior section directly oblique outwards and backwards. Free cheek as wide as the fixed cheek, lateral border flat, extending directly backwards into a short genal spine.

Thorax composed of 14 segments. Axis slightly narrower than the pleural lobe.

Pygidium small, semi-elliptical in outline; axial lobe divided at least into two axial rings; pleural lobe with indistinct segmentation; border distinct.

Subgenotype: *Probowmania* (*Mufushania*) *nankingensis* Lin (sp. nov.).

Discussion: The new subgenus differs from *Probowmania* Kobayashi 1935, typified by *Probowmania ligea* (Walcott), in its slightly longer glabellar furrow, in the broader and flatter border, and in the long palpebral lobe which is situated slightly behind the middle length of the cranidium. It differs from *Probowmaniella* Chang, 1963, in that the latter has no glabellar furrows and its glabella is truncated and conical in outline. It is also closely related to *Proasaphiscus* (*Kütsingocephalus*) Lee et Wang, 1963, but differs from the latter in having more thoracic segments, in the distinct glabellar furrows and in the small pygidium. The new subgenus differs from *Shantungaspis* Chang, 1957, in that the latter has a truncato-conical glabella, an occipital spine, convex border and brim, and a deep anterior border furrow.

Horizon: Middle Cambrian.

***Probowmania* (*Mufushania*) *nankingensis* Lin (subgen. et sp. nov.)**

(Pl. I, figs. 6—11)

Material: One complete dorsal shield, five cephalons, several cranidia and parts of thorax.

Description: Dorsal shield oval in outline. Cephalon semi-circular, slightly convex, about one-third the length of the dorsal shield. Glabella conical, large, convex, and slightly rounded in front. Three pairs of lateral glabellar furrows; anterior two pairs indistinct, posterior pair rather long and oblique backwards, bifurcated at adaxial end. Occipital furrow shallow in the middle. Occipital ring semi-elliptical in outline, arcuated backwards, with an occipital node. Dorsal furrows deep and broad, with a pit at the anterior

end, preglabellar furrow shallow. Brim as wide as the border, slightly convex. Border flat, almost uniform in width. Anterior margin rounded. Palpebral lobes of moderate size, about half the length of the glabella, situated slightly behind the middle length of the cranidium. Eye ridges distinct, stretching obliquely to the antero-lateral corner of the glabella, parallel to the anterior marginal furrow. Fixed cheek convex, nearly as wide as, or slightly narrower than, the width of the glabella between the palpebral lobes, strongly sloping down near the dorsal furrow. Postero-lateral limb narrow and long. Posterior border furrows deep and broad. Posterior border narrow and convex, a little narrower than the occipital ring. Anterior section of the facial suture stretching outwards from the anterior end of the palpebral lobe, with an angle of about $30-40^\circ$ to the axial line; posterior section extending from the posterior end of the palpebral lobe outwards and backwards. Free cheek as wide as the fixed cheek; lateral border flat, extending directly backwards into a short genal spine.

Thorax composed of 14 segments. Axis slightly narrower than the pleural lobe, gradually narrowing directly backwards and a little higher and more convex than the latter. Dorsal furrows deep and wide. Pleural lobe arched in the middle; pleural furrow broad and shallow, stretching outwards and backwards; pleural spine short.

Pygidium small, semi-elliptical in outline; axial lobe short, conical, divided at least into two axial rings with a rounded terminal lobe. Dorsal furrows shallow. Pleural lobes flat, with indistinct segmentation; border distinct and sloping down.

Cat. Nos. T006, T007, T008 (holotype), T009a—b, T010, T011.

***Probowmania (Mufushania) changi* Lin (sp. nov.)**

(Pl. I, figs. 12—17)

Material: Several incomplete cranidia.

Description: Cranidium subtrapezoidal in outline. Glabella conical in shape, moderately convex, slightly rounded in front, a little longer than half the length of cranidium. Three pairs of distinct lateral glabellar furrows; anterior pair short and nearly horizontal, second pair slightly oblique backwards, posterior pair long and strongly oblique backwards, almost reaching the occipital furrow which is narrow and deep. Occipital ring broader in the middle, semi-elliptical in outline, with a mesial tubercle. Dorsal furrows deeper than the preglabellar furrow. Brim as wide as the border, slightly convex. Anterior border furrow broad and shallow. Border arched slightly upwards, wide in the middle and very narrow on the sides. Palpebral lobe long, about half length of the glabella, located slightly behind the middle length of the cranidium. Palpebral furrows deep. Eye ridge distinct, stretching obliquely forwards from the anterior end of the palpebral lobe to the antero-lateral corner of the glabella. Fixed cheek slightly narrower than the middle part of the glabella. Posterior lateral limb narrow and long. Posterior border furrows deep and wide. Posterior border very narrow, nearly equal to the occipital ring in width. Anterior section of the facial suture stretching outwards from the anterior end of the palpebral lobe, with an angle of about 30° to the axial line; posterior section extending from the posterior end of the palpebral lobe outwards and backwards.

Comparison: The new species resembles *P. (Mufushania) nankingensis* Lin, but differs from the latter in the broad cranidium and in the narrow and upward arched rim.

Cat. Nos. T012, T013, T014, T015, T016 (holotype), T017.

图 版 說 明

本文所描述的标本均保存在南京大学地质系。

The specimens described in this paper are all kept in the Department of Geology, Nanking University.

1—5. *Paokannia* sp. (新种)

1. 头盖, 放大 1.5 倍; 登记号码: T001.
- 2a. 尾部, 放大 1.5 倍; 登记号码: T002a.
- 2b. 2a 的外模, 放大 1.5 倍; 登记号码: T002b.
3. 尾部, 放大 1.5 倍; 登记号码: T003.
4. 尾部前部碎片, 放大 2.5 倍; 登记号码: T004.
5. 尾部外模, 放大 2.5 倍; 登记号码: T005.

1—5. *Paokannia* sp. (sp. nov.)

1. Cranidium, $\times 1.5$; Cat. No. T001.
- 2a—2b. Pygidium (a) and its counterpart (b) $\times 1.5$; Cat. No. T002a—b.
3. Pygidium, $\times 1.5$; Cat. No. T003.
4. Pygidium, anterior part fragment, $\times 2.5$; Cat. No. T004.
5. Pygidium, $\times 2.5$; Cat. No. T005.

6—11. *Probowmania* (*Mufushania*) *nankingensis* Lin (新亚属, 新种)

6. 头部及胸部的一部分, 放大 2 倍; 登记号码: T006.
7. 头盖, 放大 2 倍; 登记号码: T007.
8. 头部及胸部的一部分, 放大 2 倍; 正型标本; 登记号码: T008.
- 9a. 背壳, 放大 3.2 倍; 登记号码: T009a.
- 9b. 9a 的外模, 放大 3.2 倍; 登记号码: T009b.
10. 头盖, 放大 3 倍; 登记号码: T010.
11. 头盖, 放大 3 倍; 登记号码: T011.

6—11. *Probowmania* (*Mufushania*) *nankingensis* Lin (subgen. et sp. nov.)

6. Cephalon and part of thorax, $\times 2$; Cat. No. T006.
7. Cranidium, $\times 2$; Cat. No. T007.
8. Cephalons and part of thorax, $\times 2$. Holotype; Cat. No. T008.
- 9a—b. Dorsal shield (a) and its counterpart (b), $\times 3.2$; Cat. No. T009a—b.
10. Cranidium, $\times 3$; Cat. No. T010.
11. Cranidium, $\times 3$; Cat. No. T011.

12—17. *P.* (*Mufushania*) *changi* Lin (新亚属, 新种)

12. 头盖, 放大 3 倍; 登记号码: T012.
13. 头盖, 放大 3 倍; 登记号码: T013.
14. 头盖, 放大 3 倍; 登记号码: T014.
15. 头盖, 放大 3 倍; 登记号码: T015.
16. 头盖, 放大 3 倍; 正型标本; 登记号码: T016.
17. 头盖, 放大 3 倍; 登记号码: T017.

12—17. *P.* (*Mufushania*) *changi* Lin (subgen. et sp. nov.)

12. Cranidium, $\times 3$; Cat. No. T012.
13. Cranidium, $\times 3$; Cat. No. T013.
14. Cranidium, $\times 3$; Cat. No. T014.
15. Cranidium, $\times 3$; Cat. No. T015.
16. Cranidium, $\times 3$; Holotype; Cat. No. T016.
17. Cranidium, $\times 3$; Cat. No. T017.

