

江西崇义早奥陶世的几种笔石

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本文描述的笔石是江西省地质局区测队 1964 年采于崇义茅坪早奥陶世地层中。崇义茅坪的奥陶系剖面是江西省区测队所测、剖面资料已在内部区调报告书 1:200000 赣州幅发表(江西省重工业局, 1969), 下奥陶统下部称为茅坪组, 上部称为樟木曲组。茅坪组为粉砂质板岩、中部产 *Clonograptus* sp., *Adelograptus* sp., *Bryograptus* sp. 等, 上部产 *Didymograptus*? sp., *Bryograptus* sp. 等。厚 665 米; 樟木曲组为硅质板岩, 含炭硅质板岩, 笔石较丰富, 重要的分子有: *Pterograptus elegans* Holm, *Nicholsonograptus fasciculatus* Nicholson, *Didymograptus ellesae* Ruedemann, *Amplexograptus confertus* Lapworth, *Cardiograptus amplus* (Hsü), *Glyptograptus sino-dentatus* Mu et Lee, *Didymograptus abnormis* Hsü 等, 厚 1006 米。这个剖面资料, 现已正式发表(江西省区域地层表编写组, 1980), 但未采用原先的地层名称, 而引用江西永新、宁冈一带下奥陶统爵山沟组和七溪岭组。这些笔石材料, 一部分保存在江西省区测队, 一部分保存在我所, 迄今均未作过正式描述。最近笔者整理这些标本时, 对几种比较有意义的笔石作了记述。兹列单于后: *Anisograptus chongyiensis* sp. nov., *Hemigoniograptus jiangxiensis* sp. nov., *Hemigoniograptus* sp., *Apiograptus crudus* (Harris et Thomas)。前一种产于茅坪组中部、相当于 X2 带, 后三种产于樟木曲组 *Cardiograptus amplus* 带。

肖承协等(1975)曾报道崇义县过埠(水口)西南十公里的牛皮湾至牛皮垄一条下奥陶统剖面、下部称为印渚埠组、上部称为宁国组。宁国

组为硅质板岩和含硅板岩夹含碳板岩和碳质板岩, 笔石十分丰富, 可划分为九个笔石带(N1—N9), 厚 385.5 米; 嗣后, 肖承协等(见张文堂等, 1982)又在牛皮湾测得印渚埠组详细剖面, 自下而上分为三个笔石带, 即 1. *Staurograptus-Anisograptus* 带, 2. *Triograptus* 带和 3. *Adelograptus-Clonograptus* 带。茅坪剖面与牛皮湾剖面相距不远, 看来, 茅坪的茅坪组有可能发现 *Staurograptus-Anisograptus* 带的笔石; 樟木曲组有希望找到 N1—N3 的笔石带, 值得今后进一步做详细工作。

在岩性和生物群面貌上, 崇义地区的茅坪组和樟木曲组与永新、宁冈一带的爵山沟组和七溪岭组及浙西的印渚埠组和宁国组, 特别是茅坪组和爵山沟组及印渚埠组存在明显的差异。因此, 笔者建议, 崇义地区下奥陶统仍采用原先命名的茅坪组和樟木曲组为宜。

江西省区测队赠送标本, 魏秀喆、朱正刚、吴曙提供有关资料, 胡尚卿标本摄影, 周其义清绘插图, 笔者深表谢意。

属 种 描 述

反称笔石科 *Anisograptidae* Bulman, 1950

反称笔石属 Genus *Anisograptus*

Ruedemann, 1937

反称笔石(*Anisograptus*)是路德曼(1937)创立的, 模式种为 *Anisograptus matanensis* Ruedemann。路德曼对此属下的定义是: “笔石体两侧对称, 有 12 个或更多的纤细单列的末枝, 由

重复均分产生,但有一个不对称的横索。”布尔曼(1941)讨论此属时,对属的特征作了如下的补充:“副胞管和分芽个体(即茎系——笔者注)显然在模式种中出现,也可能在 *A. richarsoni* 中出现;笔石体从下斜到水平或甚至略为上斜。”根据补充后的定义,布尔曼(1941)首次把下斜的类型,如 *Anisograptus ruedemanni* Bulman, 1941 (插图 4a—e) 和 *A. monseni* Bulman, 1941 置于反称笔石之中;最近,Cooper & Stewart (1979) 也把一些下斜的或分枝不规则的类型,如 *Anisograptus delicatulus* Cooper & Stewart, 1979 (插图, 5d, k) 和 *Anisograptus cf. delicatulus* Cooper et Stewart, 1979 等置于反称笔石之中。根据布尔曼(1950, 1970)对苔藓笔石(*Bryograptus*)下的定义,也包括下斜的类型,容易造成反称笔石和苔藓笔石相混淆,给鉴定这两个属带来困难。因此,笔者认为有必要把反称笔石加以限定,限于原始枝正分一次至六次和笔石体水平伸展或稍微上斜的类型;把那些被包括在反称笔石中的下斜的、正分或分枝不规则的类型,从反称笔石中分出,置于苔藓笔石之中。上述 *A. ruedemanni* 的正模标本和一个副模标本(插图 4d—e)为水平类型,而另三个副模标本(插图 4a—c)为下斜类型,后者应从前者分出并并入 *A. monseni*, 改称为 *Bryograptus monseni* (Bulman)。Cooper & Stewart (1979) 描述的 *A. delicatulus* 中的两个标本(插图 5d, k)为下斜类型,应从此种笔石中分出,可能代表苔藓笔石(*Bryograptus*)的一个新种。Cooper & Stewart (1979) 定为 *A. cf. delicatulus* Cooper et Stewart (插图 5c, i), 笔石体下斜或近下垂,显然代表苔藓笔石的另一个新种。Harris & Keble (1928) 建立的 *Staurograptus diffissus*, 经 Cooper & Stewart (1979) 重新研究,实际上是三个原始枝,并非四个原始枝。他们认为 *S. diffissus* Harris et Keble, 1928 的正模标本(图版 9, 图 5)与 *A. compactus* Cooper et Stewart, 1979 可能同种,因而把它归入 *A. compactus*。笔者认为,按命名法则,属名可以变动,但种名

仍然有效,应改为 *Anisograptus diffissus* (Harris et Keble)。至于布尔曼(1954)描述的 *Anisograptus isotetus* 的标本(图版 8, 图 3, ? 2; 插图 13), 胞管末部孤立,似应代表一个新属,兹取名为诺彦笔石(*Noyenograptus*), 以 *Anisograptus isotetus* Bulman, 1954 为模式种,置于戟形笔石科(*Psigraptidae*)之中。

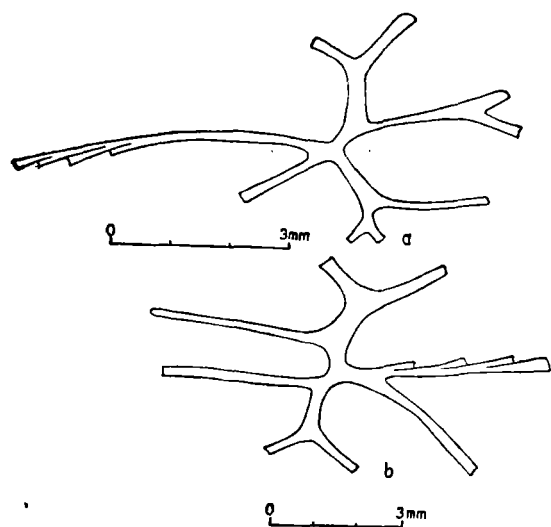
反称笔石包括下列各种: *Anisograptus diffissus* (Harris et Keble, 1928), *A. matanensis* Ruedemann, 1937, *A. matanensis tetragraptoides* Ruedemann, 1937, *A. richardsoni* Bulman, 1941, *A. flexuosus* Bulman, 1941, *A. ruedemanni*, Bulman, 1941, *A. norvegicus* Bulman, 1954, *A. grandis* Bulman, 1954, *A. lui* Mu, 1955, *A. dissolutus* Berry, 1960, *A. communis* Tzaj, 1968, *A. matanensis minor* Wang et Wu, 1977, *A. zhougguoensis* Wang et Wu, 1977, *A. guangdongensis* Wang, Liu et Zhou, 1979, *A. compactus* Cooper et Stewart, 1979, *A. delicatulus* Cooper et Stewart, 1979, *A. diffissus zhejiangensis* Mu, 1982, *A. minutus* Mu, 1982, *A. orientalis* Mü, 1982, *A. chongyiensis* sp. nov..

崇义反称笔石(新种) *Anisograptus chongyiensis* sp. nov.

(图版 1, 图 1—3; 插图 1a—b)

笔石体小,直径 10 毫米左右。三个原始枝正分两次,共有 9 个末枝。原始枝短 0.2—1 毫米,宽 0.2—0.4 毫米;二级枝长 0.8—2.2 毫米(未分枝的二级枝长达 3.5—5 毫米),宽 0.2—0.3 毫米(背压),0.4 毫米(侧压),二级枝的分枝角不等,从 40°—90°;三级枝一般不发育,长仅 1 毫米左右,个别可达 3 毫米。

胞管一般不清楚,仅在少数的枝上见到正胞管,为简单的直管状,长 1.1 毫米、口部宽 0.15 毫米,口缘平,相邻胞管间掩盖 $\frac{1}{2}$, 倾角小,3.5 毫米内有 4 个胞管(10 毫米内应有 12 个胞管)。

插图1 *Anisograptus chongyiensis* sp. nov.

a. Holotype; 登记号 77090 b. Paratype; 登记号 77091

比较 在笔石体大小和原始枝较短等特征上,新种与汪啸风等(1979)描述的 *Anisograptus guangdongensis* Wang, Liu et Zhou 比较相象,但后者笔石体更为细小和原始枝仅正分一次。在笔石体一般性质上,此种笔石与 *Anisograptus minutus* Mu 也较相象,但后者笔石体小和原始枝较长。

棱笔石科 Goniograptidae Yu et Fang, 1979

半棱笔石属 Genus *Hemigonigraptus* Jin et Wang, 1977

半棱笔石是金玉琴和汪啸风(1977)创立的,其特征是:笔石体由两个下斜或平伸的原始枝和五级以上的分枝所组成。原始枝短,发育型式为均分笔石式,分枝方式同棱笔石,胞管为细长的直管。金、汪把它置于均分笔石科。最近,俞剑华、方一亨(1979)把具棱笔石式正分枝的一类笔石,归入他们的新科——棱笔石科(Goniograptidae)。笔者认为,这一意见是可取的。

半棱笔石与弯笔石(*Sigmagraptus*)在外形上十分相象。通过对崇义茅坪樟木曲组中半棱

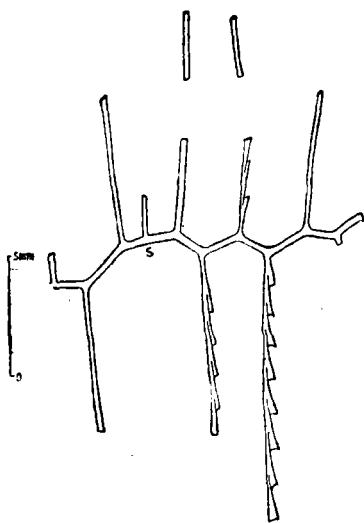
笔石的研究,笔者认为, Benson 和 Keble(1935)描述为 *Sigmagraptus laxus* (T. S. Hall) 的三个标本(图版 32, 图 10, 11, ?12), 其实打问号的这块标本(图版 32, 图 ?12)倒象弯笔石,可归入 *Sigmagraptus laxus* (T. S. Hall), 其余两个标本,却是棱笔石式的正分枝,应为半棱笔石。根据笔石体的大小和主要性质, 图版 32 图 10 的标本应是 *Hemigonigraptus declinatus* Jin et Wang 的成员,而图版 32, 图 11 的标本则可归入 *H. horizontatus* Jin et Wang。Cooper (1979)描述为 *Sigmagraptus laxus* (T. S. Hall) 的新西兰标本,为标准的棱笔石式正分枝的半棱笔石,分枝达 19 级以上,分枝距离 0.6—1.2 毫米,一般 0.8 毫米,最长的外分枝 8 毫米,显然代表半棱笔石的一个新种。这样,半棱笔石共有下列 5 种: *Hemigonigraptus declinatus* Jin et Wang, 1977, *H. horizontatus* Jin et Wang, 1977, *H. jiangxiensis* sp. nov., *H. sp. nov.*, *H. sp.*

江西半棱笔石(新种)

Hemigonigraptus jiangxiensis sp. nov.

(图版 1, 图 4—5; 插图 2)

笔石体由两个齿状曲折的“主枝”组成,其中一个“主枝”长约 9 毫米,另一“主枝”仅保存

插图2 *Hemigonigraptus jiangxiensis* sp. nov.

Holotype; 登记号 77902

4.5 毫米。两个原始枝水平伸展,各由一个胞管组成,长约 1.1 毫米,宽 0.25 毫米。胎管长锥形,与原始枝垂直相交,长 1.8 毫米,口部宽 0.2 毫米,原始枝正分枝五次以上,分枝方式属棱笔石式,各级枝的分枝(内分枝)距离 1.3—1.8 毫米,外分枝较长,最长的可达 13.5 毫米,分枝角 90° 和 120° ,各级枝的宽度大致相当,为 0.3—0.4 毫米。

胞管仅在少数外分枝上见到,为细长的直管状,长 2 毫米,口部宽 0.2 毫米,腹缘直或微凹,口缘平,相邻胞管间掩盖 $\frac{1}{3}$,倾角小,仅 10° ,10 毫米内有 7—6 个胞管。

比较 新种各级枝的外分枝与“主枝”轴向垂直相交,并相互平行是其特征,容易与此属已知的种相区别。

半棱笔石(未定种)

Hemigoniograptus sp.

(图版 1, 图 6; 插图 3)

仅保存一个“主枝”,长 11 毫米。分枝八级以上,分枝方式属棱笔石式,各级枝的分枝距离

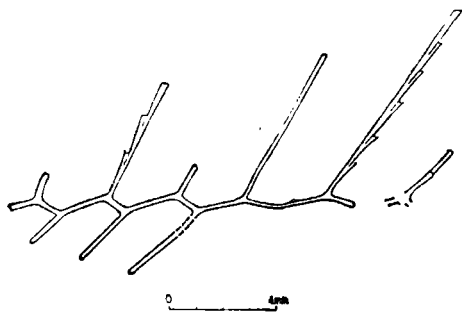


插图 3 *Hemigoniograptus* sp.
登记号 77093

为 1.3—2.6 毫米,分枝角颇规则,一组为 85° — 110° ,另一组为 150° — 155° 。各级枝均较纤细,宽度大致相当,为 0.25—0.3 毫米,各级枝的外分枝与“主枝”轴向斜交,而且相互平行,外分

枝一般较长,最长的达 11 毫米。

胞管仅在少数外分枝上见到,为细长的直管状,长 2 毫米,口部宽 0.2 毫米,相邻胞管间掩盖 $\frac{1}{3}$,倾角小,仅 10° ,10 毫米内有 7 个胞管。

当前的标本各级枝的外分枝与“主枝”轴向斜交,而且相互平行,这是比较特殊的,容易与此属已知的种相区别。但由于标本仅保存一个“主枝”,详细情况不明,不值得给予种的命名。

等称笔石科 *Isograptidae* Harris, 1933

等称笔石科是 Harris (1933) 创立的,后来很少有人采用。李立新、倪寓南 (1979) 研究青海奥陶纪笔石时,起用了等称笔石科。等称笔石类的笔石,始端发育型式比较特殊,而且此类笔石在笔石的演化、分类上具有重要地位,有不少笔石属都是源自此类笔石。因此,把这类笔石独立成科是适宜的。假等称笔石(*Pseudisograptus*)是从等称笔石(*Isograptus*)演化而来的,而梨笔石(*Apiograptus*)是从假等称笔石演化而来,这被它们始端的发育型式和出现的层位所证实。等称笔石——假等称笔石——梨笔石是一条演化系列。因此,笔者把这三个属一同归入等称笔石科。长期以来, Bulman (1938, 1955, 1970) 一直把等称笔石置于均分笔石科(*Dichograptidae*); 假等称笔石是 Beavis (1972) 创立的,把它置于中国笔石科(*Sinograptidae*),而乔新东(1977)把它归入柯坪笔石科(*Kalpino-graptidae*); 梨笔石是 Cooper & McLaurin(1974)创立的,把它置于均分笔石科,而穆恩之等(1979)把它置于隐笔石科(*Cryptograptidae*)。笔者认为,等称笔石、假等称笔石和梨笔石的始端发育型式是相同的,即胎管大,第一个胞管从胎管上部生出后沿胎管壁向下生长,与胎管对称排列。这三个属的主要不同点在于: 等称笔石始端几个胞管开口向下,相邻胞管没有叠覆,假等称笔石始端几个胞管开口向外,相邻胞管

部分叠覆,而梨笔石与假等称笔石相似,只是两枝攀合而已。这正反映它们从低级到高级的演化发展过程。

梨笔石属 Genus *Apiograptus*

Cooper et McLaurin, 1974

未熟梨笔石 *Apiograptus crudus*

(Harris et Thomas)

(图版 I, 图 7; 插图 4a—b)

- 1935 *Glossograptus? crudus*, Harris et Thomas, pp.303—304, fig. 1, no. 13; fig. 2, nos. 15—17
 1965 *Paracardiograptus abnormis*, 姚伦琪, 114—115 页, 图版 I, 图 8a—d; 插图 3
 1974 *Apiograptus crudus*, Cooper et McLaurin, pp. 81—84, Text-fig. 2a—h
 1979 *Apiograptus crudus*, Cooper, p. 80, pl. 15, fig. 62

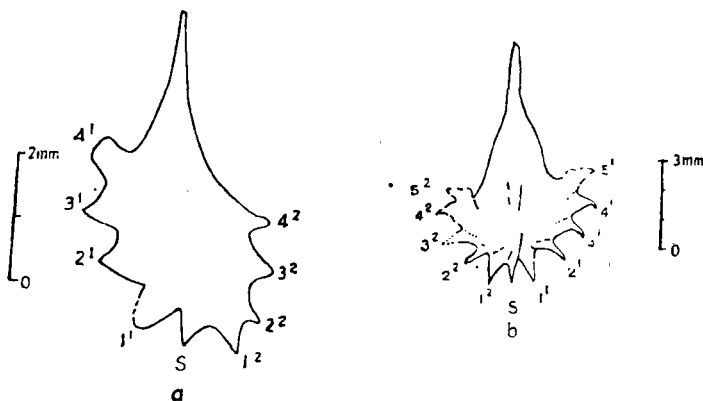


插图 4 *Apiograptus crudus* (Harris et Thomas)

a. 登记号 77904 b. 根据 Cooper et Steward (1979), 插图 2b

比,胎管较短小。

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SOME EARLY ORDOVICIAN GRAPTOLITES FROM CHONGYI, JIANGXI

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Abstract

The graptolites described in the present paper were collected in 1964 from the Early Ordovician strata in Maoping, Chongyi by the Regional Geological Surveying Team of the Geological Bureau of Jiangxi. According to the study of the Heavy Industry Bureau of Jiangxi (1969), the Lower Ordovician Series of Maoping, Chongyi may be divided into two units: 1. the Maoping Formation, 665 m in thickness, consisting of silt slate and yielding *Clonograptus* sp., *Adelograptus* sp., *Bryograptus* sp., etc. in the middle part of this formation and *Didymograptus*? sp., *Bryograptus* sp., etc. in the upper part; 2. the Zhangmuqu Formation, 1,006 m in thickness, composed of siliceous slate carbonaceous, siliceous slate. This formation is rich in graptolites, containing *Pterograptus elegans* Holm, *Nicholsonograptus fasciculatus* Nicholson, *Didymograptus elesae* Ruedemann, *Amplexograptus confertus* Lapworth, *Cardiograptus amplus* (Hsü), *Glyptograptus sinodentatus* Mu et Lee *Didymograptus abnormis* Hsü etc..

Based on the study of this section and its graptolites, the two graptolite-bearing beds in the Maoping Formation are roughly corresponding to X2 and X3 respectively; while the Zhangmuqu Formation may be divided into four graptolite zones, namely *Didymograptus*

abnormis, *Cardiograptus amplus*, *Amplexograptus confertus* and *Pterograptus elegans* zones.

Four significant species of graptolites are described in this paper, viz. *Anisograptus chongyiensis* sp. nov., *Hemigonograptus jiangxiensis* sp., nov. and *Apiograptus crudus* (Harris et Thomas), among which the first species occurs in the middle part of the Maoping Formation, corresponding to X2; the others occur in the *Cardiograptus amplus* zone of the Zhangmuqu Formation.

Description of the new species

Anisograptus Ruedemann, 1937

With *Anisograptus matanensis* Ruedemann as the type species, the genus *Anisograptus* was established by Ruedemann (1937), who pointed out: "Rhabdosome bilaterally symmetrical, typically possessing 12 or more slender uniserial terminal branches, produced by repeated dichotomous division, but with an asymmetric funiculus." Later, Bulman (1941) stated in his discussion on the genus that: "bithecae and budding individuals are apparently present in the type species and probably also in *A. richardsoni*, and the rhabdosome varies from declined to horizontal or even slightly reclined." It can be seen from Bulman's discussion on this genus that the declined forms were assigned to *Anisograptus* for the first time. According to

Bulman (1950, 1970), the diagnosis of *Bryograptus* also included the declined forms. This makes it difficult to distinguish *Anisograptus* and *Bryograptus* from each other. Therefore, the writer is inclined to propose that *Anisograptus* must be restricted to those forms with dichotomous branches and horizontal or slightly reclined rhabdosome, while those with lateral or irregular branches and declined rhabdosome must be separated from *Anisograptus* and referred to *Bryograptus*. The three declined forms of *Anisograptus ruedemanni* Bulman, 1941 (Text-fig. 4a—c) must be separated from *A. ruedemanni* and incorporated into *Anisograptus monseni* Bulman which should be transferred to *Bryograptus monseni* (Bulman). Similarly, the two declined forms of *Anisograptus delicatulus* Cooper et Stewart, 1979 (Text-fig. 5d, k) which probably represent a new species of the genus *Bryograptus*, also must be separated from *A. delicatulus* Cooper et Stewart. The specimens of *A. cf. delicatulus* Cooper et Stewart, 1979 (Text-fig. 5c, i) are declined or nearly pendent, probably representing another new species of the same genus. The specimens of *Anisograptus isolatus* Bulman, 1954 (Pl. 8, figs. 3, 12; Text-fig. 13) obviously represent a new genus because of their distally isolated thecae. The writer proposes to name it as *Novenograptus* gen. nov., which belongs to the family Psignaptidae, with *Anisograptus isolatus* Bulman 1954 as type species.

***Anisograptus chongyiensis* sp. nov.**

Rhabdosome small, 10 mm in diameter, consisting of 9 terminal stipes; three primary stipes short, 0.2—1 mm in length and 0.2—0.4 mm in width; each dichotomously divided into two secondary stipes 0.8—2.2 mm in length (undivided secondary stipes 3.5—5 mm in length). Secondary stipes bifurcate at an angle of 40°—90°; tertiary ones incompletely developed, only 1—3 mm in length.

Thecae (probably autothecae) only seen on some terminal stipes, in simple tubes, 1.1 mm in length and 0.25 mm in width across the aperture, overlapping half their length, and

inclined to the axis of the stipes at a low angle, with 4 of them in 3.5 mm.

Comparison: In the small rhabdosome and the short primary stipes, the new species is similar to *Anisograptus guangdongensis* Wang, Liu et Zhou, but differs from the latter in having a larger rhabdosome and a greater number of terminal stipes. In general characters of the rhabdosome, this species resembles *Anisograptus minutus* Mu, but in the latter, the rhabdosome is smaller and the primary stipes are longer.

***Hemigoniograptus* Jin et Wang, 1977**

In general characters of the rhabdosome, this genus is closely similar to *Sigmagraptus*, but differs from the latter in having dichotomous branches of the Goniograptid type. One of the Australian specimens described by Benson and Keble (1935, Pl. 32, fig. 112) as *Sigmagraptus laxus* (T. S. Hall) may belong to *Sigmagraptus laxus*, while the other two should be referred to *Hemigoniograptus*. Based on the size and the main characters of the rhabdosome, the two specimens (Pl. 32, figs. 10—11) should be referred to *Hemigoniograptus declinatus* Jin et Wang and *H. horizontatus* Jin et Wang respectively. The specimen of New Zealand described by Cooper (1979) as *Sigmagraptus laxus* (T. S. Hall) is characterized by the multi-dichotomous branches, with a branching distance of 0.6—1.2 mm and by the 8 mm long “outer” branched, clearly representing a new species of the genus *Hemigoniograptus*. The genus *Hemigoniograptus* contains five species, namely *Hemigoniograptus declinatus* Jin et Wang, *H. horizontatus* Jin et Wang, *H. jiangxiensis* sp. nov., *H. sp. nov.* and *H. sp.*

***Hemigoniograptus jiangxiensis* sp. nov.**

Two primary stipes horizontal, each consisting of 1 theca, 1.1 mm in length and 0.25 mm in width. Sicula very clear, elongately conical, 1.8 mm long and 0.2 mm wide at aperture. Primary stipes dichotomously branching for 5 times at an angle of 90°—120°, in the mode of Goniograptid type; branching distance of

all stipes 1.3—1.8 mm; “outer” branches longer, 13.5 mm in length width of all stipes nearly uniform, about 0.3—0.4 mm.

Thecae in the form of long and slender tubes, 2 mm long and 0.2 mm wide across the aperture; ventral margins straight or rather concave; apertural margins plain, overlapping

one-third their length and declining at a small angle of about 10° , with 7—6 of them in 10 mm.

Comparison: The new species is easily distinguished from the known species of the genus by the straight “outer” branches, which run parallel with each other and are perpendicular to the axis of the “main stipes”.

图 版 说 明

描述的标本保存在中国科学院南京地质古生物研究所

图 版 I

1—3. *Anisograptus chongyiensis* sp. nov.

1. $\times 6$, 2. $\times 10$; Holotype. 采集号 Fm 16—14; 登记号 77090. 3. $\times 6$; Paratype. 采集号 Fm 16—10; 登记号 77091.

4, 5. *Hemigoniograptus jiangxiensis* sp. nov.

4. $\times 3$; Holotype. 采集号 Fm 109-2; 登记号 77902.

5. $\times 6$; 系图 4 始部放大, 示胎管和胞管性质。

6. *Hemigoniograptus* sp.

$\times 3$; 采集号 Fm110-1; 登记号 77904.

7. *Apiograptus crudus* (Harris et Thomas)

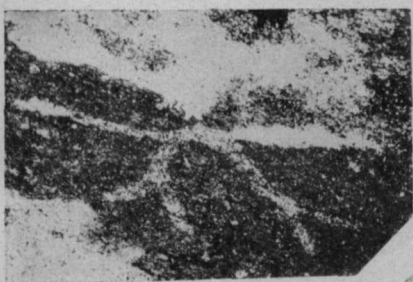
$\times 10$; 采集号 84-6; 登记号 77904.



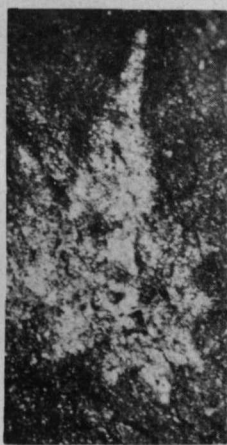
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