

大兴安岭晚泥盆世新菊石羣及其在生物分类上的意义

常 安 之

(中华人民共和国地质部地质研究所)

近百年来泥盆纪菊石分类问题已有一定基础,一般人多认为上泥盆纪菊石在演化上可分为两大支,海神石和稜菊石。1943年德农万(Donovan)发现了 *Archoceras angulatum* Donovan, *Archoceras varicosum* 之后,认为上泥盆纪晚期菊石在演化方面可能分为三支——海神石、稜菊石和古菊石(*Archoceras*)。其中古菊石一支后来缺乏记载,因而他的意见就被忽视了。总之,古菊石(*Archoceras*)的来源和发展问题,曾引起不少的争论。辛德危尔夫(Schindewolf)首先认为古菊石是由 Manticoceratidae 科中分出,并且可能是海神石的祖先。事实上 Manticoceratidae 科中最简单缝合线的一些种属,也都比古菊石复杂。Manticoceratidae 科显著的特征是其腹部上的缝合线有一小中央鞍,也就是其腹叶常为中央鞍所分割,并且 Manticoceratidae 科一般又都出现在泥盆纪早期地层中而和古菊石同时或近同时。因此,在亲缘上它们不可能有相互演变的关系。另一方面,古菊石的缝合线又常与 Cheiloceratidae 科中 *cheiloceras* 属的个别种的幼年期类似,但不同之点是在两者的缝合线在相应位置的比例上有一些区别。在古菊石较高的层位中,海神石颇为发育。例如, *Progonioclymenia acuticosta* (Braun) 的缝合线又与古菊石类似。由于彼此体管的位置不同,因而就很难对比。

由上列事实可以看出,古菊石可能是晚泥盆纪菊石演化三大支之一。

1957年中苏合作队在大兴安岭冕渡河一带大民山附近发现了极其丰富的法明期(Famennian)菊石羣。经初步研究后认为其中一部分材料是属于新的科属,特别提出讨论。至于大兴安岭晚泥盆世菊石羣化石将由著者另文发表。

按照已知科属并不能包括大兴安岭两个菊石新属,并且是属一个新科,定为中国菊石科。

在发育过程中该新科是以腹叶出现,其形状确与已知的较低层位中的 Anarcestidae, Prolobitidae 两科及同层位的 Cheiloceratidae 科迥异,前者系长漏斗状,后者则是以“V”字形或不封闭的“V”字形为特征。尤其是壳的形状,除与 Anarcestidae 科中 *Archoceras* 微有类似外,其余特征均为 Prolobitidae, Cheiloceratidae 两科所无。就壳表发育情况论,又和 Goniclymeniaceae 及 Clymeniaceae 相似,但在体管位置上彼此又截然不同。从缝合线论,又与 Prolobitidae 中的 *Sandbergeroceratinae* 相似;但二者的壳形相差又很大,尤其后者的壳表常具有显著的横脊。由成年期的缝合线及壳形相比,则新科似乎又与 Prolobitidae 中层位最低的 *Cycloclymenia planorbiformis* 相似,但 *Cycloclymenia planorbiformis* 在上泥盆纪出现的层位反较它缝合线更复杂的 Sinotitidae 科为高。因此,它们之间似乎不应有

任何直接亲緣的关系。若从全部縫合綫发育过程来看,新科的幼年期縫合綫又常与 Anarcestidae 科中的 *Archoceras* 属成年期相类似。但后来成年期則相差較远,虽然形态又有所类似。由此可以看出,这个新科可能直接由 Anarcestidae 科中 *Archoceras* 属分出来的,并且比較进化。这个新科首次在中国大兴安岭发现,名为中国菊石科。首先,深深感謝,微·依·烏士特利斯基专家和李莉、常美丽两位同志給予著者研究材料。其次,这篇短文是在孙云鑄教授指导下进行的,作者深为感謝。尤其是底·維·納里夫金院士和其夫人經常鼓励和指示,作者特为感謝。最后邵洁、賴才根同志整理图版及抄写文稿,俞成培同志描繪插图,吳留生同志摄制图片,著者一并致謝。

科 中国菊石科 1960

Family Sinotitidae Chang, 1960

定义: 个体小。壳形由超外旋至微內旋。口很低,腹部寬圓,凸起或下陷。臍寬而以漏斗状下陷。体室长。縫合綫呈稜菊石状,偶生叶和鞍比較規則。壳面光滑或具微弱的生长綫。輪环的厚度超过它的高度,前一輪环的厚度仅及后一輪环的五分之三,輪环数目較多,可至 8 个左右。

这个新科有二属——中国菊石 (*Sinotites*) 和孙氏菊石 (*Sunites*)。

属 中国菊石 新属

Sinotites Chang, 1960

属型: *Sinotites sinensis* Chang 新属,新种。

特征: 壳体小,微有內旋,形似鼓。輪环很低,剖面呈月牙状,寬度超过高度,腹部凸起的很高,很快地向兩側边弯曲。臍很寬而以漏斗状向內凹陷很深,它的直径約占壳体直径的 60% 左右。縫合綫属稜菊石式,外縫合綫具有四对鞍和三对半叶。輪环 7.5—8 圈。住室长度可达輪环长度的 1/2—2/3。横断面呈橢圓状,体管位于靠近腹部的边緣。

討論: 这一个新属是根据几块保存較好的成年期标本。外部周围凸起,和 *Archoceras* 相似。主要区别是:一方面这属具有特殊的縫合綫,外縫合綫的鞍和叶数繁多,常以三对代替了两对,体管位置靠近背部的边緣。另一方面在輪廓和縫合綫上它的幼年期和 *Cycloclymenia planorbiformis* 相似,但从成年期更复杂的縫合綫的差別(具有更多的叶和鞍)以及很清楚腹叶可以識別,特別是一个长而不封閉的盔形腹叶。

层位及产地: 內蒙大兴安岭巽渡河車站,大民山(东北峯正东 1.45 公里)晚泥盆紀后期(法門期)上大民山阶中。

中国菊石中国种

Sinotites sinensis Chang 新属及新种

(图版 I 图 1a-d 附插图)

敘述: 壳小,微有內旋,体形似鼓,輪环低,横断面呈新月状,寬大于高,腹部寬,中央拱起得很高,并向兩側边弯曲。輪环体积增加得很慢,后一个輪环約为前一个輪环的一倍半,輪环压縮利害,并向內部傾斜。臍寬而深,約占壳体直径的百分之六十三。从全型标

本可以测出脐的最大的直径是 7.2 毫米,由壳体腹部口的边缘通过脐到相对的一侧壳体最大直径约为 11.5 毫米。在全型标本上并不带口缘,壳体高约 2 毫米,宽 5.2 毫米(估计)。

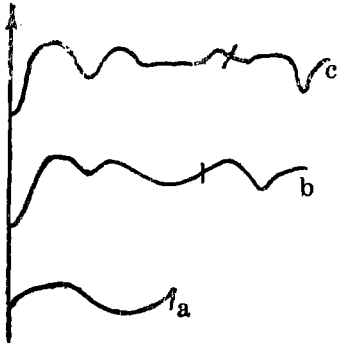


图1 *Sinotites sinensis* Chang 新属
新种示缝合线的发展情况

c. 成年期 $\times 6.7$ D(直径)11.5 毫米

b. 壮年期 $\times 14$ D(直径)3.2 毫米

a. 幼年期 $\times 20$ D(直径)1.5 毫米

Figure 1 Diagrammatic representations of complete sutures of *Sinotites sinensis* Chang during ontogenetic development

a. Early suture in Archoceras stage of development, $\times 20$; at a diameter of about 3.2mm.

b. Adolescent suture $\times 14$; at a diameter of about 3.2mm.

c. Mature suture, $\times 6.7$; at a diameter of about 11.5mm.

气室距离很大,隔壁稀疏。缝合线成稜菊石式,具有一个大而深的盔形腹叶,各有一个圆的“U”字形腹侧鞍在它的两侧,一个较小的“U”字形腹侧叶(一个偶生叶),有一个宽圆的“U”字形鞍在腹侧的边缘,一个浅而平并且弯曲侧叶位于侧区的边缘上,一个或多或少突起宽的侧鞍,一个不对称的侧叶(一个侧区偶生叶),和一个圆的“U”字形鞍在脐的边缘上和一个小的背侧叶及一窄而深的背叶。在几块标本上生长线很清楚,就是双突起,或是由一个浅圆的腹或腹缺和腹侧及脐侧形成约两个突起。腹部生长线很浅,微向后弯曲。

讨论:从形态来看,这种和 *Sinotites multiseptata* Chang (Gen. et sp. nov.) 和 *Sunites suni* Chang (Gen. et sp. nov.) 都是有些相似,并且同一地点和层位,特别是缝合线和宽而深的脐共同点上极难区别,但和 *S. multiseptata* Chang (Gen. et sp. nov.) 区别是在于它的每一个旋圈只有为数很少的几个隔壁,和 *Sunites suni* Chang (Gen. et sp. nov.) 的区别在于它具有宽圆而凸起的腹部和比较多的轮环的数目。

层位和产地:产内蒙古自治区冕渡河,白库,大民山东北峰正东 1.45 公里晚泥盆纪上部(法門阶)上大民山阶中(李莉、常美丽采集)。

多隔壁中国菊石 新属新种

Sinotites multiseptata Chang

(图版 I 图 2a-g)

特征:气室长度适中,隔壁紧密,壳体的腹部宽而高,并且特别凸起。

描述:壳体小,属菊石壳型,形似鼓,微有内旋。轮环低,横切面呈新月状,宽大过高,腹宽特别凸起,由腹中央向两侧弯曲,轮环体积增加很慢,很受压缩,并向内部倾斜。脐宽下陷或呈漏斗状,约占标本的百分之三。脐的最大直径约 6.4 毫米,壳体最大直径由脐部口的边缘通过脐到相对的一边约 10.5 毫米,最大高度和宽度是 1.5 毫米,6.1 毫米。壳体压缩带很浅。

气室长度中等,隔壁紧密,靠近口缘的气室较前面的尤为缩短。缝合线呈稜菊石型:一个大而深的盔形腹叶,在两侧各有一个对称的“U”形腹侧鞍,一个对称“U”形腹侧叶(一个偶生叶),一个宽圆对称的“U”字形位于腹侧边缘的鞍部;在侧区边缘上另有一个似“U”字形的侧叶,和一个突出的背侧鞍。

在全型标本上的生长细微清楚。双凸形是由一个浅圆的腹或腹缺,一个简单宽圆的

突起在腹侧,另一个窄圆的突起在脐的边缘上。

在最后一个旋圈上的表面具有一个显著而且有规则的沟或收缩沟,在腹部稍向后弯曲。

比较: 这种是和 *Sinotites sinens* Chang 很相似的,但具有较多的隔壁,较小脐,气室长度约为前一种的三分之一。

层位及产地: 同前。

孙氏菊石 新属

Sunites Chang, 1960

属型: *Sunites suni* Chang

特征: 壳体小,超外旋,横切面形似“X”字形。轮环很低,横切面呈下玄月形,宽大大地超过高度,腹部宽圆而向下凹。脐宽而以漏斗状下陷,约占壳体直径十分之七。缝合线呈稜菊石式:外缝合线具有四对鞍和四对半叶。生长线很不清楚,可能属双凸形。轮环数目一般由 4.5—5.5 个圈。住室长达半个轮环,体管小而不连续,横断面呈圆圈状,位于腹部的边缘。

层位及产地: 大兴安岭大民山区,上泥盆纪上部(法門期)。

比较: 这属壳形,缝合线的式样和脐的特征和新属 *Sinotites* Chang 相类似,但 *Sinotites* 的腹部宽圆而凸起,旋圈数目也较 *Sunites* 为多,而后的腹部多向内下陷,并且形成一个“凹”形,确与前者相反。

这个新属名以导师孙云铸教授的姓命名,借表敬意。

孙氏菊石孙氏种 新属新种

Sunites suni Chang, 1960

(图版 I 图 3a-g)

特征: 壳体小,椭圆形。腹部宽圆,下陷较深;背部拱起。

描述: 这个种的建立是依据两块标本,一个系保存好的内模,但微有破碎。另一块保存较差,部分生长线露出。为了便于识别,除复制修饰照片外,另制再造图。

壳体小,菊石形,横切面形状似“X”字形,轮环受压缩,侧区稍微地突起。腹部较宽圆,下陷且深,背部特别向下凸起。全型标本口部不完整,由腹部口的边缘通过脐至另一相对的侧边缘的最大直径约 6.5 毫米,壳体最大的高度和宽度是 1.1 毫米和 4.1 毫米(估计)。

脐广宽,保存很好,直径约占全型直径的十分之七,最大直径约 4.4 毫米。壳体的表面保存较差,没有遗留任何装饰。

气室长度适中,内缝合线不明显。全型标本的闭锥末端每一条外缝合线是由一个漏斗状的腹叶,在它的内侧各有一个小圆而且对称的“V”字形腹侧鞍,一个较窄圆的近似“U”字形腹侧叶,在腹部外侧的边缘上有一个宽圆而微尖的侧叶,一个不对称的宽圆而平的(具有显著突起)侧鞍,一个非常浅圆而稍尖的叶(一个侧区偶生叶),一个小圆的轻微对称的背侧鞍。在全型的标本上体管未能显出,根据另一标本的推测,体管较小,横切面似圆形,位于背部的边缘。

层位及产地: 内蒙古自治区大兴安岭、白庫、大民山东北峯正东 1.45 公里。晚泥盆紀后期大民山阶上部(李莉、常美丽采集)。

圓形孙氏菊石 新属新种

Sunites cyclicus Chang

(图版 I 图 4a-h)

特征: 壳体小,圓形。腹部寬圓稍微下陷,背部輕微地凸起。

描述: 这种仅有几块內模和碎片,都产生在同一产地和层位中。

壳体小,双凹形。輪环側区另有輕微地突起,腹平或輕微地內凹,背部輕微地凸起,測量如下:

	A	B
直径(毫米)	7.1	6.1
高度(毫米)	1.6	1.7
寬度(毫米)	3	2.8
臍的直径	4.6	3.2
寬度: 直径	0.46	0.46
寬度: 高度	1.87	1.64

臍寬广,直径約占壳体直径的十分之六。共型的标本保存很坏,表面沒有任何裝飾。縫合綫呈稜菊石型,如前一种。

比較: 这种和属型孙氏菊石很相似,但壳体比較規則,側視圓,腹部浅少稍微內陷。

层位及产地: 同前。

参 考 文 献

- [1] 李承三、叶連俊, 1930. 云南北部之泥盆紀. 中国地質学会志, 20 卷 3—4 期。
- [2] 田奇瑞, 1935. 中国之泥盆紀. 地質論評, 3 卷 4 期。
- [3] 侯德封, 1938—1939. 四川西北部古生代地层的两个剖面. 地質論評, 4 卷 6 期。
- [4] 李四光、赵金科、张文佑, 1944. 广西地层表。
- [5] 赵金科, 1947. 广西地层发育史. 中国地質学会志, 27 卷 321—346 頁。
- [6] 孙云鑄, 1947. 云南古生代地层問題. 地質論評, 12 卷 1—2 期。
- [7] 孙云鑄, 1951. 葛氏脉动說的意义. 中国海洋湖沼学会, 1 卷 1 期。
- [8] 孙云鑄, 1950. 从地层观点論古生物学. 地質論評, 16 卷 7—12 頁。
- [9] 孙云鑄等, 1954. 历史地質学. 地質出版社 1954 年版, 72—82 頁。
- [10] 王鴻禎, 1956. 地史学教程. 地質出版社 1956 年版, 171—191 頁。
- [11] 斯特拉霍夫, 1956. 地史学原理下册. 地質出版社 1956 年版, 9—44 頁。
- [12] 王莹、宁奇生, 1957. 大兴安岭中南部哈拉哈河上游泥盆紀地层及其岩相特征. 地質知識, 9 期 3—7 頁。
- [13] Chao, K. K., 1956. Notes on some Devonian Ammonoids from Southern Kwangsi. *Acta Palaeont. Sinica*. Vol. 4, No. 2, p. 101—116, p. 1. 1.
- [14] Deprat, J., 1912. Mem. d. Service geol. de l'Indochine. Vol. 1, fus. 1. Pt. 1.
- [15] Devonian, D. T., 1943. Species of Archoceras from Saltern Cve Devon. *Proceedings Bristol Naturalists Soc.*, series IV, Vol. IX, Part IV, p. 375—380.
- [16] Fong, K. L., 1929. Geology and Mineral Resources of Kwangsi. *Geol. Surv. Kwangsi and Kwangtung, Annual Report*, Vol. 11.
- [17] Fritz, Frech, 1902. Über devonisch Ammoniten, Beiträge Zur Palaeozoica, und Geologie Österreich-Ungarns und des Orients, Bd. 14, p. 27—111, Pls. 2—5.

- [18] Fritz, Frech, 1913, Ammonoidea Devonicae. Fossilium catalogus I: Animalia Part 1, p. 1—42.
- [19] Grabau, A. W., 1921. Text-book of Geology, Part 2. Historical geology, p. 372—437.
- [20] Grabau, A. W., 1923. Stratigraphy of China. *Geol. Surv. China*, p. 140—198.
- [21] Grabau, A. W., 1930. Problems in Chinese stratigraphy. *Science Quarterly of the National Univer. Peking*. Vol. 2, Part 4—5.
- [22] Grabau, A. W., 1931 Palaeozoic centers of faunal evolution and dispersal. *Bull. Geol. Soc. China*, Vol. XI, No. 3, p. 227—239.
- [23] Grabau, A. W., 1936. Pal. Sinica. Series B. Vol. 8, fascicle 4.
- [24] Joleaud, L., 1939. Atlas De Paleobiogeographie.
- [25] Ku, C. W., 1950. Devonian Stratigraphy of the Po-shi area, with a special discussion on the stratigraphical position of the Devonian Fish-bearing series of eastern Yunnan. *Bull. Soc. China*, Vol. XXIX, p. 75—84.
- [26] Lee, C. S. and Yeh, B. T., 1940. On the Devonian of Northern Yunnan. *Bull. Geol. Soc. China*, Vol. XX, No. 3—4, p. 275—281.
- [27] Lee, J. S., 1939. The geology of China, p. 1—500.
- [28] Miller, A. K. and Flower, R. H., 1938. A *Sporadoceras* from America. *Jour. Geol.* Vol. 44, p. 751—757.
- [29] Miller, A. K., 1983. Devonian Ammonoid of America. *Geol. Soc. America, special paper* No. 14, p. 1—262, Pls. 1—39.
- [30] Misch, P., 1946. Remarks on the Tectonic history of Yunnan, with special Reference to its relations to the type of the young orogenic deformation. *Bull. Soc. China*, Vol. XXV, No. 1—4, p. 70—80.
- [31] Nalivkina, A., 1936. Upper Devonian Goniatites beds of the Ay River, South Ural. *Transaction of the United Central Geological and Prospecting Institute, Fascicle*, 79, p. 1—23, Pls. I—II.
- [32] Perna, E., 1914. Die Ammonoiten des oberen Neodevon von Ostabhang des Sudurals. *Com. Geol. St. Petersburg*, Mem., N. S., Vol. 89.
- [33] Sobolew, D., 1914. Über Clymenien und Goniatiten. *Palaeontologisch. Zeitschrift*, Band I, p. 349—375.
- [34] Spath, F. L., 1934. Catalogue of the fossil Cephalopoda in the British Muscum, Pt. III.
- [35] Schindewolf, O. H., 1923. Beitrage zur Kenntnis des Palaeozoicums in Oberfranken etc. *Neues Jahrbuch*. XLIX. Beilage-Band.
- [36] Sun, Y. C., 1945. Devonian subdivisions of eastern Yunnan, Science Record Academia Sinica. Vol. 1, No. 3—4.
- [37] Sun, Y. C., 1948. Problems of the Palaeozoic stratigraphy of Yunnan, Fiftieth anniversary papers of the National Peking University.
- [38] Sun, Y. C., 1948. The Pacific—a main centre of dispersal of early Palaeozoic life. *International geological congress. Eighteenth Session*.
- [39] Sun, Y. C., 1935. On the occurrence of the *Manicoceras* fauna in central Hunan. *Bull. Soc. China*. Vol. XIV, p. 249—252.
- [40] Salomon, W., 1926. Grundzuge der Geologie. Band II.
- [41] Tien, C. C., 1928. A study of the Devonian sections in Changsha and Sientan districts, Central Hunan, *Geol. Surv. Hunan, Bull.*, 11, 1, p. 1—25.
- [42] Tien, C. C., 1938. Pal. Sinica, New Ser., III, 4.
- [43] Wedekind, R., 1918. Die Genera der Paleo-ammonoidea, *Palaeontographica*. Bd. 62, p. 85—184, Pls. 14—22.
- [44] Yoh, S. S., 1956. Subdivision, zonation and correlations of the Devonian formations in Lungmenshan Area, Northwestern Szechuan, *Acta. Geol. Sinica*. Vol. 34, No. 4, p. 443—468.
- [45] Бодылевский, В. И., 1953г. Малый атлас руководящих ископаемых.
- [46] Герасимов, Н. Б., 1953. О факторах видообразования и о значении их для стратиграфии. Материалы Палеонтологического совещания по палеозою 14—17 мая 1951г. Изд. АН СССР.
- [47] Добролюбова, Т. А., 1948. Изменчивость кораллов филогенетического ряда *Dibunophyllum bipartium* (M' Coy)—*Caninia okensis* Stuck. Изв. АН СССР, серия биологическая. № 2.

NEW LATE UPPER DEVONIAN AMMONITE-FAUNAS OF THE GREAT KHINGAN AND ITS BIOLOGICAL CLASSIFICATION

CHANG AN-CHI

(Institute of Geology, Ministry of Geology)

Since the last century the classification of the Upper Devonian Ammonite-faunas has been discussed by various authors and the faunas have generally been subdivided into two main branches, namely, Goniatitids and Clymenids.

In 1938 O. H. Schindewolf first considered that the genus *Archoceras* might be derived from Manticoceratidae, and that it might be the ancestor of Clymeniaceae. D. T. Donovan (1943) considered that the evolution of the Upper Devonian Ammonite-faunas might be subdivided into the following branches:—*Clymenia*, *Goniatite* and *Archoceras*. Since his discovery of *Archoceras angulatum* Donovan and *A. varicosum* (Drevermann), this branch of *Archoceras* has been scarcely recorded, and therefore the problem on the phylogeny of the *Archoceras* is still in dispute.

In fact the most primitive suture of some genera of Manticoceratidae is even more complex than those of *Archoceras*. The suture of Manticoceratidae is marked by a small median saddle which divides the ventral lobe at its ventral side. As *Archoceras* and members of Manticoceratidae were almost contemporaneous, the direct relationship between them is almost impossible. Moreover, the suture of *Archoceras* is rather similar to that of some species of Cheiloceratidae in larval stage, except that the ratio of the relative position of their respective sutures differs from each other.

Above the *Archoceras* horizon Clymenids are abundant. For example, the suture of *Progonioclymenia acuticosta* (Braun) resembles that of *Archoceras*, but the position of the siphuncle differs so much in both forms that comparison between them is difficult.

It is evident that *Archoceras* probably represents one branch of the three main groups of the Upper Devonian Ammonite-faunas.

The materials dealt with in this paper were obtained by a field party under the leadership of Dr. V. E. Ustritski the Soviet specialist of the ministry and the 7th Party of the 116 Group from Taminshan area of the Great Khingan in 1957. This collection is rather rich and mainly composed of Famennian Ammonite-faunas.

In this paper it is intended to deal with two new genera probably belonging to one New Family while the whole Ammonite-faunas will be studied and published in a separate paper.

These two new genera differ from all the known genera and certainly belong to a new family, hence the name, Sinotitidae, is now proposed for it.

Through out its stages of development, this new family is characterized by the appearance of the ventral lobe. The shape of the suture of this new family differs entirely from that of Anarcestidae, belonging to the lower horizon and Cheiloceratidae of the same horizon. The former belongs to the funnel-like type, while the latter is characterized by V-shaped or unclosed V-shaped type.

Except the shell form this new family slightly resembles that of *Archoceras* of the family Anarcestidae, but all the other characters of our family, are absent in Prolobitidae and Cheiloceratidae. Again the development of the new family resembles that of Gonioclymeniaceae and Clymeniaceae, but they differs from one another in the relative position of the siphuncle.

Besides, the suture of the new family resembles that of Sandbergeroceratinae of the family Prolobitidae but they differ in the form of the shell owing to the presence of the conspicuous ribs in the latter.

The suture and shell form of the adult form of the new family apparently resembles that of *Cyclocymenia planorbiformis* which occurs in a higher stratigraphical position than Sinotitidae of complex suture type. Hence direct phylogenetic relation between them is deemed impossible.

In view of the whole development of the suture in the larval stage, the new family resembles *Archoceras* of the family Anarcestidae, but mature sutures are different, though their shape still resembles each other.

Therefore, it is evident that this new family Sinotitidae might be derived from *Archoceras* of the family, Anarcestidae.

As members of the new family were first discovered from the Great Khingan hence a new family Sinotitidae is proposed for it.

The writer wishes first of all to extend his thanks to Dr. V. E. Ustritski and his students, Miss L. Lee and Miss M. L. Chang, and Mr. C. S. Nin of the Seventh Party of 116 Captain for the valuable materials collected for this study. He is also very much indebted to Prof. Y. C. Sun under whose direction the present paper is prepared. Finally, he also likes to extend his sincere thanks to Prof. D. V. Nalivkin and Prof. A. K. Nalivkina for their direction and encouragement.

Family Sinotitidae Chang, fam. nov.

This family includes two genera—*Sinotites* and *Sunites*. Shell small (few cm. in diameter) increasing slowly in height; whorl section very low, and with broadly rounded, smooth, convex or concaved venter.

Typically, there is no prominent ornamentation on the surface, but the growth-lines are of biconvex type with very shallow, rounded ventral or hyponomic sinus and both on the umbilical shoulder and ventro-lateral zones of the conch. The Growth-lines with slight forward-bending on the ventral portion probably indicates a nectobenthonic habit.

The suture-lines are goniatitic type, with very large, deep helmet-shaped ventral lobe, and on either side of it there are a rounded U-shaped ventro-lateral saddle, a small U-shaped ventro-lateral lobe (an adventitious lobe), a broadly rounded U-shaped saddle on the ventro-lateral seam, a very shallow, flattened (but distinctly convex) lateral lobe on the outside of the lateral, a very broadly rounded U-shaped lateral saddle, a small lateral lobe, a rounded U-shaped saddle on the umbilicus seam and an inner derso-lateral and one dorsal lobe.

Members of this family is fairly abundant in the collection of the Great Khingan, Inner Mongolia. Stratigraphically, the family is confined to the Lower Famennian of the Upper Devonian.

Genus *Sinotites* Chang gen. nov.

Genotype; *Sinotites sinensis* Chang

Diagnosis: Conch small more or less involute, and drum shaped in form. Whorls very

low, umbilicus wider than high and with lunar cross section. Ventral broadly arched, curving strongly toward the lateral edges. Umbilicus very wide and deep, occupying about 60 percent of the diameter. Suture-line of goniatic type with four pairs of saddles and five and half pairs of lobes on the external side. Growth-lines visible but of biconvex type. Whorls number $7\frac{1}{2}$ to 8. Length of the body-chamber about one-half or two-third the length of the whorl. Siphuncle small, dorsal and marginal in position, and circular in cross-section.

Remarks: The material upon which this new genus is erected comprises several well-preserved specimens. The general external form of this new genus recalls that of the typical *Archoceras* in having an arched outer periphery, but differs in the character of the suture-lines. Our new form is characterized by a large number of saddles and lobes in external side in mature specimens of that genus, usually with four pairs instead of two. The siphuncle is dorsal and marginal in position. Again, it is very closed to *Cycloclymenia* Hyatt (= *Phenacoceras* Frech) in the general outline and its character of the sutures in larval stage but differs from the latter form in having many saddles and lobes particularly on the external in adult stage. The new form is marked by very large open helmet-shaped ventral lobe.

Horizon and Locality: Upper Taminshan formation of the late Upper Devonian (Famennian), 1.45 km east of the North-East Crest, near Taminshan, Pie-cu, Mei-tou-ho, Great Khingan, Inner Mongolia.

***Sinotites sinensis* Chang gen. et sp. nov.**

(Pl. I, figs. 1a—d)

Diagnosis: Conch broadly arched and obliquely ventral with widely separated septa, and very long camerae.

Description: Shell small, more or less involute, drum-shaped in form. Whorls very low and lunar in cross-section, usually wider than high. Venter broadly arched, curving strongly towards lateral edges. Whorls slowly increasing in size, usually with one and a half times that of the preceding, and very compressedly oblique to inner side. Umbilicus very deep and wide, occupying about 63% of the diameter in the preserved part of the holotype the maximum diameter of umbilicus measures about 7.2 mm, while that of the conch measures about 11.5 mm from the adoral end of the preserved part of the venter across the umbilicus to the opposite side of that specimen. The adoral end of the holotype is not preserved. The conch is about 2 mm high and 5.2 mm (estimated) wide. The aperture is not preserved, but the camerae are generally considerable in length. The septa are not crowded, but the adoral camera of the holotype is distinctly shorter than the preceding camerae, probably indicating that the present specimen represents a mature individual. The suture-lines are of goniatic type, with very large, deep helmet-shaped ventral lobe, and on either sides of it a rounded U-shaped ventro-lateral saddle, a smaller U-shaped ventro-lateral lobe (an adventitious lobe), a broadly rounded U-shaped saddle on the ventro-lateral seam, a very shallow, flattened but distinctly convex lateral lobe on the outside of the lateral, a small but asymmetrical lateral lobe (a lateral adventitious lobe), a rounded U-shaped saddle on the umbilicus seam. Traces of the growth-lines are distinct in some specimens. The growth-lines are of biconvex type with very shallow, rounded ventral or hyponomic sinus on the umbilical shoulder and ventro-lateral zones of the conch. The growth-lines with slight forward-bending on the ventral portion probably indicates that the animal once had a necto-benthonic habit.

Remarks: Morphologically, this species bears some resemblance to *Sinotites multiseptata* Chang (Gen. et sp. nov.) and *Sunites suni* Chang (Gen. et sp. nov.) of the late Upper Devonian of the Great Khingan, and is characterized by its form, and broad and deep umbilicus, but differs from *S. multiseptata* Chang (Gen. et sp. nov.) in a few number of whorls of the septa in every volution, and from *Sunites suni* Chang in its broadly arched ventral and a large number of whorls.

Horizon and Locality: Upper Taminshan formation, late Upper Devonian (Famenian), 1.45 km east of the North-East Crest, near Taminshan, Pie-cu, Mei-tou-ho, Great Khingan, Inner Mongolia.

***Sinotites multiseptata* Chang gen. et sp. nov.**

(Pl. I, figs. 2a—f)

Diagnosis: Conch small with very broadly arched venter, camerae moderate in length, septa, crowded.

Description: The conch is small in size, drum-shaped in form and more or less involute. The whorls are very low usually wider than high, and with lunar cross-section. The venter is very broadly arched, curving strongly from the median portion towards the lateral edges. The whorls increase slowly in size. The whorls are strongly compressed, oblique towards the inner side. The umbilicus is very wide and deep, occupying about three-fifth the diameter of the whole conch. The maximum diameter of the umbilicus attained by the preserved part of the holotype measures about 6.4 mm, and that of the conch is about 10.5 mm as measured from the adoral end of the preserved part of the venter cross the umbilicus to the opposite side of the specimen. The maximum height and width are about 1.5 mm and 6.1 mm respectively. The depth of an impressed zone is rather shallow.

The camerae are of moderate length and the septa are somewhat crowded, but the adoral camera of the holotype is evidently shorter than the preceding one, indicating that this specimen probably represents an individual of mature stage. The suture-lines are of goniatitic type, with a large deep helmet-shaped ventral lobe, and on either side of it a rounded U-shaped symmetrical ventro-lateral saddle, a small symmetrical U-shaped ventro-lateral lobe (an adventitious lobe), a broadly rounded symmetrical U-shaped saddle on the ventro-lateral seam, a more or less rounded V-shaped lateral lobe on the outside of the lateral, a convex lateral saddle, a small more or less rounded pointed lobe (a lateral adventitious lobe), and a small rounded U-shaped dorso-lateral saddle.

Traces of growth-lines are distinct in the holotype. These are of biconvex type and characterized by a very shallowly rounded ventral or hyponomic sinus, a single, broadly rounded salient on the ventro-lateral, and a narrowly rounded salient on the lateral of the umbilical seam.

The surface is sculptured by distinct regular grooves or constrictions which are particularly distinct in the last volution. The forward bending on the ventral position indicates that the animal once adopted a nectobenthonic habit in the sea.

Remarks: This species differs from the preceding species—*Sinotites sinensis* Chang in the large number of the septa, the shorter camerae (about one-third the length of the preceding species) and in its small umbilicus.

Horizon and Locality: As the preceding.

Genus *Sunites* Chang gen. nov.**Genotype: *Sunites suni* Chang gen. et sp. nov.**

Diagnosis: Conch small in size, very evolute and biconcaved form.

Whorls very low and lunar in cross-section, usually wider than high. Venter broadly concaved rounded. Umbilicus very wide and deep, occupying about seven-tenth of the total diameter. Suture-lines of goniatitic type with four pairs of saddles and one-half pairs of lobes on the external side. Growth-lines indistinct, probably of biconvex type. The number of whorls is from four and one-half to five and one-half. The length of the body-chamber is about one-half the length of whorl. The siphuncle is small and circular in cross-section, but ventral and marginal in its position.

Remarks: Insofar as the form of the conch, the character of sutures and the nature of the umbilicus are concerned, these two genera—*Sinoites* and *Sunites* are somewhat similar, but the ventral form of *Sinoites* is broadly rounded and arched and the number of volutions of the preceding genus is more than that of the later while *Sunites* is of biconcave type instead of convex ventral form.

The genus is named in honour of Prof. Y. C. Sun under whose direction the present paper is made.

Horizon and Locality: Upper Taminshan formation of the late Upper Devonian (Famennian), 1.45 km east of North-East Crest, near Taminshan, Pie-cu, Mei-tou-ho, Great Khingan, Inner Mongolia.

***Sunites suni* Chang gen. et sp. nov.**

(Pl. I, figs. 3a—g)

Diagnosis: Shell small in size, elliptic in form, rather broadly rounded, and deeply impressed ventrally, but distinct arched dorsally.

Description: This species is represened by two specimens, an internal mold being fairly complete but somewhat wornout. However, both sides of the type specimen are well preserved so that the writer has been able to recognize the form of the conch and the character of the sutures easily.

Our specimen is small in size, ammoniticonic in its mode of growth, and biconcave in form. The whorls are only slightly convex laterally, rather broadly rounded and deeply impressed ventrally, but arched dorsally. The holotype appears to be incomplete dorsally, and attains a maximum diameter of about 6.5 mm from the adoral end of the ventral across the umbilicus to the opposite side of the specimen, and a maximum height and width of the conch of about 1.1 mm and 4.1 mm respectively (estimated).

The umbilical portions of the holotype are well preserved, and appear to be exposed with a diameter of about seven-tenth of that of the holotype. The umbilicus of the holotype attains a maximum diameter of about 4.4 mm and is so poorly preserved that no trace of the conch is retained.

The camerae are moderate in length. The nature of the internal sutures is known, but on the adoral portion of the phragmacone of the holotype the external suture forms a siphon-shaped ventral lobe and on either side of it a small rounded symmetrical U-shaped ventro-lateral saddle,

a similar rather narrowly rounded U-shaped ventro-lateral lobe, a broadly rounded U-shaped saddle on the outside of venter, a shallow, relatively shallowly rounded, more or less pointed asymmetrical lobe on the outside of the lateral, a broad, relatively broadly flattened (but distinctly convex) a symmetrical lateral saddle, a very shallow rounded more or less pointed lobe (a lateral adventitious lobe), a small rounded slightly symmetrical dorso-lateral saddle. Not any trace of the siphuncle of the holotype is discernible, but another specimen probably shows that the siphuncle is small, and circular in cross section, but ventral and marginal in its position.

Horizon and Locality: As the preceding.

Sunites cyclicus Chang gen. et sp. nov.

(Pl. I, figs. 4a—h)

Diagnosis: Shell small, rounded in form, rather broadly flattened, more or less impressed ventrally but slightly arched dorsally.

Description: This species is represented by several internal molds.

The conch is biconcave in form, and the whorls are slightly convex laterally, flattened or slightly impressed ventrally, but slightly arched dorsally. The conch is small, and the measurements of the two specimens are given as follows:

	A	B
Diameter (mm)	7.1	6.1
Height (mm)	1.6	1.7
Width (mm)	3	2.8
Diameter of the umbilicus (mm)	4.6	3.2
Width over diameter	0.42	0.46
Width over height	1.87	1.64

The umbilicus appears to be exposed, and its diameter is about six-tenth that of the whole specimen. The syntype is so poorly preserved that no trace of the conch is retained the suture is the same as the preceding species.

Remarks: This species closely resembles *S. suni*, the genotype, but differs from the latter particularly in elliptic form, more rounded form of the lateral side, and more shallowly impressed venter area.

Horizon and Locality: Same as the preceding.

EXPLANATION OF PLATE

1. *Sinotites sinensis* Chang gen. et sp. nov.
 1a, 1c. Lateral and ventral views of the holotype, $\times 2$.
 1b. Cross section of the paratype, $\times 1$. Cat. No. Ce 0060A.
 1d. Diagrammatic representation of a mature suture of the holotype, $\times 3$. Cat. No. Ce0060.
2. *Sinotites multiseptata* Chang gen. et sp. nov.
 2a, 2b. Lateral and ventral views of the holotype, $\times 1.8$.
 2c. Diagrammatic representation of a mature suture of the same, $\times 1.2$.
 2d, 2e. Lateral and ventral views of the same, $\times 3.2$.
 2f, 2g. Diagrammatic representation of the same, $\times 2.6$. Cat. No. Ce0061.
3. *Sunites suni* Chang gen. et sp. nov.
 3a, 3b. Lateral and ventral views of the holotype, $\times 4.5$.

- 3c. Diagrammatic representation of a mature suture of the same, $\times 7$. Cat. No. Ce0062.
 3d, 3e. Diagrammatic representation of the lateral and ventral views of the same, $\times 3$.
 3f, 3g. Lateral views of paratypes, $\times 2$. Cat. No. Ce0062A.
 4. *Sunites cyclicus* Chang gen. et sp. nov.
 4a. Lateral view of the holotype, $\times 2$.
 4e. Lateral view of the same, $\times 3$. Cat. No. Ce0063.
 4b. Diagrammatic representation of a suture of the same, $\times 7$.
 4d, 4c. Lateral and ventral views of the paratype, $\times 2$. Cat. No. Ce0063A.
 4f, 4g, 4h. Lateral views of paratypes, $\times 3$, $\times 2$, $\times 3$. Cat. No. Ce0064, Ce0065, Ce0066.

图 版 说 明

1. *Sinotites sinensis* Chang gen. et sp. nov. 中国菊石中国种 新属新种

图 1a, 1c 侧视和腹视, 正型 $\times 2$;

图 1d 缝合线, 正型 $\times 3$, 登记号 Ce 0060.

图 1b 横断面, 副型 登记号 Ce 0060A;

2. *Sinotites multiseptata* Chang gen. et sp. nov. 多隔壁中国菊石

图 2a, 2b 侧视和腹视, 正型 $\times 1.8$;

图 2c 缝合线, 正型 $\times 1.2$;

图 2d, 2e 侧视和腹视, 正型 $\times 3.2$;

图 2f, 2g 正型示意图 $\times 2.6$ 登记号 Ce 0061

3. *Sunites suni* Chang Gen. 孙氏菊石孙氏种

图 3a, 3b 侧视和腹视, 正型 $\times 4.5$;

图 3c 正型缝合线 $\times 7$ 登记号 Ce 0062;

图 3d, 3e 正型示意图 $\times 3$;

图 3f, 3g 侧视, 圆形孙氏菊石, 副型 $\times 2$, 登记号 Ce 0062 A—B

4. *Sunites cyclicus* Chang Gen. et sp. nov.

图 4a 侧视, 正型 $\times 2$;

图 4e 侧视, 正型 $\times 3$

图 4b 缝合线, 正型 $\times 7$; 登记号 Ce 0063;

图 4c, 4d 腹视和侧视, 副型 $\times 2$ 登记号 Ce 0063A;

图 4f 侧视, 副型 $\times 3$ 登记号 Ce 0064

图 4g 侧视, 副型 $\times 2$ 登记号 Ce 0065

图 4h 侧视, 副型 $\times 3$ 登记号 Ce 0066

