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Part X, A Dictionary of Invertebrate Paleontology: Letter Q

Kristian P. Saether, Sandra J. Carlson, Andrew K. Rindsberg, and Lothar H. Vallon

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PART X, TREATISE ONLINE 194:

A DICTIONARY OF INVERTEBRATE PALEONTOLOGY: LETTER Q

Kristian P. Saether[1], Sandra J. Carlson[2], Andrew K. Rindsberg[3], and Lothar H. Vallon[4]

[[1]Corresponding author, kris.saether@gmail.com; [2]Department of Earth and Planetary Sciences, University of California, sjcarlson@ucdavis.edu; [3]Biological and Environmental Sciences, University of West Alabama, arindsberg@uwa.edu; [4]KALK, Østsjællands Museer, kv@oesm.dk]

This is the first installment of *The Treatise*, *Part X*, covering the letter Q. The final version is intended to be a complete dictionary of invertebrate paleontology, covering all those descriptive terms for invertebrate groups and aspects of fossil research treated in other Parts of *The Treatise*, fully referenced with quotations. More information about the entries selected for inclusion, and how their definitions were crafted, will be provided in a forthcoming article.

Q. (abbrev.). Quenstedt (muscle) scar.

S. Morris (1985): 124. … *elongated ligamental area, chalky deposits, Quenstedt muscle scar (**Q**), line of body wall …*

q. (abbrev.). Quenstedt (muscle) scar.

P.A. Johnston (1991): 297. *Fig. 2. … **q** = Quenstedt scar; …*

Wisshak & others (2009): 9. *Fig. 4. … **q** = scar of Quenstedt muscle; …*

Q.c (symbol). quartibrachial.

R.C. Moore & Laudon (1941): 415. SYMBOLS FOR CRINOID PARTS … ***Qc***—*quartibrachials.*

Qingjiang biota (noun). an assemblage of early Cambrian organisms described in 2019 from Hubei Province, southern China. Dated at 518 Ma, it is located about 500 miles north of the site of the possibly coeval Chengjiang biota. Its most abundant taxa are cnidarians and arthropods (including arachnids, crustaceans, insects, and millipedes).

Fu & others (2019): 1338. *Although it is approximately coeval to the Chengjiang biota … the **Qingjiang biota** appears to have occupied a more distal environmental setting, in which a different early Cambrian ecosystem flourished.*

Li & others (2021): 1. *A minute limpet-shaped shell,* Qingjianglepas elegans *n. gen. n. sp., is reported from the 518 million-year-old **Qingjiang biota** in Hubei, China.*

Ma & others (2023): 2. *The growth strategy and brooding strategy of* †I. minor *may serve as a key factor in driving this taxon as the most abundant* †Isoxys *species in both **Qingjiang** and Guanshan paleoecosystems.*

Q.M. (abbrev.). Quenstedt (muscle) scar.

Sekino & Yamashita (2016): 501. *Figure 7. … **QM**, Quenstedt muscle insertion; …*

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quadrangle (noun). a cell in the wing of some zygopteran insects, similar in position to a triangle in anisopterans. It is formed by a combination of triangular divisions, creating a unit with four distinguishable sides.

Needham (1903): 715. The **quadrangle** of the Zygoptera. – *In the suborder Zygoptera triangle and subtriangle bear different relations to each other and to surrounding parts of the wing. Together they constitute a unit of wing structure. They are placed in line, not directed apart by an obtruding angle of the cubitus, and are oftenest confluent through the atrophy of the middle cross vein. To the four-sided figure, which together they always present, we will apply the technical term "**quadrangle**" …*

Laidlaw (1923): 320. *A special area of the wing, the **quadrangle** of the Zygoptera and the "triangles" of the Anisoptera, is spoken of as the distal cell.*

Ware & others (2025): 9. *In Cephalozygoptera, the eodichromatoid **quadrangle** (semirectangular and much longer than broad) seems to strongly distinguish those possessing it from those with the sieblosioid **quadrangle** (distal side longer than basal, posterior side longer than anterior…*

quadrangular (adj.). describing a body part, especially a bivalve shell, characterized by the presence of four distinct angles in outline, so that it is somewhat square to rectangular in profile. See also Fig. 1.

Tuomey (1854): 172. I. quadrangularis. *Shell **quadrangular**, curved, irregular; septa somewhat regular, abruptly bent downwards, …*

J. Duncan (1860): 109. *The dorsal portion is the metanotum, commonly **quadrangular**.*

Rolleston (1870): 225. ***Quadrangular** reticulations, formed by the 'interambulacral' ossicles.*

Yamakawa & Ishikawa (1912): 17. *Shell **quadrangular**, flattened, both ventral and dorsal sides equally and only weakly convex, with cross-section lenticular.*

Gobbett (1963): 63. *Shell **quadrangular** in outline, markedly concavo-convex.*

Szwedo (2007): 128. *Genus* Neazonia *gen. nov. … Diagnosis: Prothoracic tibia **quadrangular** in cross section, with rows of short setae along margins.*

P.D. Taylor (2021): 74. *Autozooids opening on frontal surface of internodes in two to four series, rounded **quadrangular**, all examples ovicellate, …*

—**quadrangularly** (adv.) in a quadrangular shape or manner.

Whitfield (1877): 43. *The form of the volution has been **quadrangularly** ovate in section, vertically compressed, with the greatest vertical thickness at about the inner third …*

Rigby, Embree & Murphy (1996): 713. *The relatively simple skeleton is composed of **quadrangularly** arranged hexactines with overlapping rays, an arrangement strikingly similar to the skeletal structure of early Paleozoic reticulosid hexactinellids.*

Yanagi & Nomura (2021): 88. *… anterior margin **quadrangularly** emarginate behind head, almost horizontal on median part, with …*

Syn. **quadrangulate**.

Fig. 1. Quadrangular shell shape displayed in *Hiatella arctica* (Linnaeus, 1767 in 1766–67). Shell length is 11.7 mm. After J.G. Carter & others (2012: fig. 251), adapted from Mikkelsen & Bieler (2007).

quadrangulate. See **quadrangular**.

Goding (1926): 295. *Pronotum destitute of a posterior process, more or less sexangulate or* ***quadrangulate****; base of head frequently elevated in a transverse carina; …*

Winsor, Johns & Yeates (1998): 399. *Table 2 … Body cross sectional profile … cylindrical,* ***quadrangulate****, ellipsoidal, dorsally ridged, dorsum broadly convex almost flat, ventrally concave.*

Jacobs, Scholtz & Strumpher (2015): 4. *Holotype description. …* Mentum: *… anterior margin rounded; anterior surface* ***quadrangulate*** *and excavated …*

quadrannulate (noun). describing a condition in which a body part is divided into four ring-like segments, or annuli.

Beddard (1901): 202. *Beyond observing that the anterior segments are bi- to* ***quadr-annulate****, the description of the species gives no details of the annulation of these segments.*

Smith (1909): 1094. ***quadrannulate*** *… composed of four annuli, as certain segments of the body of some earthworms.*

Takafumi (2022): 141. Orobdella ibukifukuyamai *can be distinguished from the four sexannulate species, i.e., … and by its somite VII that is quinquannulate (****quadrannulate*** *in …).*

quadrapartite See **quadripartite**.

B.E. Smith (1909): 1094. ***Quadrapartite*** *… Same as* quadripartite.

quadrat (noun). a sampling unit, or the instrument used to define it, used in various paleontological branches of study (especially paleoecology), being a defined square to rectangular area, typically less than or equal to one square meter, selected to represent a larger area, for use, e.g., in estimates of biodiversity or relative abundance.

Clements (1905): 164. *The unit size of* ***quadrat*** *is the meter, and when the term is used without qualification, it refers to the meter quadrat.*

Wallace (1984): 459. *Detailed palaeocological mapping of fossiliferous bedding planes and surfaces at right angles to bedding often yields much more information than does mere random study. The technique presents few theoretical problems, though* ***quadrat*** *size must be carefully selected for optimum results,*

quadrate (adj.). having four distinguishable sides, e.g. of a shell; squarish.

Stebbing (1893): 55. *In these Crustacea the carapace is often of a breadth greater than the length, wide and regularly arched in front, more rarely* ***quadrate*** *or suborbicular, but not rostrate.*

Hayward (1981) 26. Menipea ignota *n. sp. … Description: … Zooids rather* ***quadrate****, the frontal planes of the two series forming an acute angle.*

Bhattacharya, Banerjee & Roy (2022): 208. *The shell is very large (height = 12.5 cm, maximum width = 14 cm and aperture height = 3 cm), turbinate with flat base and* ***quadrate*** *in cross section …*

—quadrately (adv.) with a quadrate form.

Lea (1843): 10. *Genus Panopæa. P. dubia … Shell* ***quadrately*** *elliptical, transverse, inequilateral, posteriorly truncate, anteriorly rounded, …*

Lycett (1850): 347. *Trichites* nodosus. … Shell ***quadrately*** *curved, with longitudinal waved nodose ribs; ribs few, diverging, some bifid.*

Rigby, King & Gunther (1981): 842. *The skeleton is made of moderately* ***quadrately*** *arranged, ranked spicules, all in vertical and horizontal series …*

Gonzalez, Gustafson & Engel (2019): 56–57. *Key to extant tribes of Megachilinae … male T7 large, exposed, **quadrately** surrounded by T6; male S1 with slender, …*

quadriannulate (adj.). having, consisting of or marked by four rings; quadrannulate.

W. Clark (1856): 321. *Abdomen **quadriannulate**, oval.*

C.F. Baker (1898): 32. *Femora more or less completely heavily triannulate with dark, the fore and middle tibiæ more or less completely **quadriannulate***; …

Oceguera-Figueroa (2006): 200. *Somites I, II, III, IV uniannulate, somite V and VI biannulate, somite VII triannulate, VIII **quadriannulate**, somites of middle series, IX-XXIII complete quinquannulate, XXIV and XXV **quadriannulate**, XVI triannulate and XXVII biannulate.*

quadriarticulate (adj.). applied to an articulated body part having four joints in normal operation, e.g. in the palpi of some insects.

Kirby (1802): 36. *In all the* Ammophilæ *that I have examined, the* interior palpi *are **quadriarticulate** …*

Wollaston (1860): 255. *Its entire structure and **quadriarticulate** feet leave no doubt whatsoever, on my mind, that it is rightly referred to the* Colydiadæ*; and I believe that its nearest allies are the European genera* Pycnomerus *and* Xylolæmus.

Blöte (1945): 323. *The Nabidae are differing from* Scotomedes *by the **quadriarticulate** rostrum, by the abdomen showing seven segments and by the structure of the apical part of the hemielytra.*

Palatov & Marin (2021): 447. *Maxilliped: … palp **quadriarticulate**, article 1 without setae on outer margin, …*

quadricapsular (adj.). describing a structure containing four capsules, used primarily in botany but occasionally in the taxonomic description of such features in some insects.

Lee (1799): 27. *In respect to external division, the pericarpium is either* absent*, as in the order Gymnospermia of the Class Didynamia;* unicapsular*, consisting of one capsule, as in Lychnis;* bicapsular*, of two, as in Pæonia and Asclepias;* triscapsular*, of three, as in Veratrum and Delphinitum;* **quadricapsular***, of four, as in Rhodalia;* quinquecapsular*, of five, as in Aquilegia; or* multicapsular*, of many, as in Caltha, Trollius and Helleborus.*

Gordh & Headrick (2011): 1141. ***QUADRICAPSULAR** … Descriptive of structure which embraces four capsules.*

quadricarinate (adj.). bearing four carinae, e.g. of insect setae.

Shea & Iskandar (2020): 145. … *dorsal scales posteriorly on body tricarinate, occasionally **quadricarinate**, more weakly tricarinate on tail; …*

Cullen & Harvey (2021): 39. *Setae generally aligned perpendicularly from body, each seta **quadricarinate**.*

quadricostate (adj.). (of a conodont) bearing four costae, or ribs.

Zhen (2020): 241. *Diagnosis. Coniform seximembrate apparatus consisting of long-based S elements with a proclined cusp to form a symmetry-transition series, including tricostate alate Sa, tricostate asymmetrical Sb, strongly asymmetrical and laterally compressed acostate Sc and **quadricostate** Sd elements, and short-based scandodiform P elements; …*

S. Zhang (2023): 1151. *Fig. 6. Conodonts from upper member, the Turner Cliff Formation … posterior view of **quadricostate** element, …*

quadridentate (adj.). bearing four serrations, teeth or tooth-like projections.

Montagu (1808) 85. Cancer floridus … *Thorax smooth, indented and uneven;*

front slightly bilobate, sides ***quadridentate****: antennæ …*

Pate (1940) 262. … *apical margin of lobe* ***quadridentate****, with a gently sinuous median portion and a distinct emargination between each two lateral teeth.*

quadrifid (adj.). divided deeply into four parts by cleft-like troughs. This term has been historically used predominantly in botany, but is still common in invertebrate taxonomy and, increasingly now, ichnotaxonomy.

H.J. Carter (1871): 119. *The figures 37–39 and 72–74 inclusively all appertain to a* ***quadrifid*** *or quaternate system, which, whether belonging to the Coralliospongiæ or to the Pachytraginæ, only find their parallel now, …*

Bergquist (1944): 29. *Metacalycoceras? sp. … first lateral lobe wide, as long as siphonal lobe,* ***quadrifid****; remainder not clearly shown.*

Keighley & Pickerill (1998): 86. … *the invertebrate trackway … could, alternatively have contained (a) sets of one, two, three, or more striate, and, or, punctate imprints that may be (b) unifid (apostrophe-form), bifid, trifid, and, or,* ***quadrifid*** *and (c) transversely, obliquely, and, or, longitudinally oriented.*

Feist & Clarkson (2023): 250. *Thoracic segments with fan-shaped,* ***quadrifid*** *anterior pleural projection distally.*

quadriform (adj.). roughly square in shape; squarish.

H.J. Carter (1873): 450. *Frequently the shaft presents a* ***quadriform*** *inflation just below the giving off of the rays; and sometimes a little tubercle in the centre of the four rays, which is the end of the shaft, is prolonged into a fifth ray.*

Chaboo & Engel (2009): 204. Eosocanthus delocranioides *gen et. sp. n. … Head exposed up to behind eye margins; size small; shape* ***quadriform****, not elongate; hypognathous, …*

Zhen, Allen & Martin (2022): 48. *Oepikodus Lindström, 1955 … Both genera are characterized by having a* ***quadriform*** *or protoquadriform alate Sa element and represent a clade …*

quadrijugate (adj.). possessing four juga.

T.R. Jones (1890): 17. *The middle or horse-shoe ridge not being free below, and the two lateral sulci not quite reaching the ventral margin, place it nearer to the* ***quadrijugate*** B. Hallii *than to* Bollia.

quadrilateral (adj.). describing a body shape that has four distinguishable flanks, margins or sides in profile.

Parkinson (1811): 35. … *in the otherwise very correct description of this fossil by M. d'Annone, are said to be* ***quadrilateral****, whilst, in the figure they are depicted pentagonal.*

Brady (1865): 190. Cythere aspera*, n. sp. … Valves oblong,* ***quadrilateral****, compressed.*

Imaizumi (1959): 26. Hexapus Nakajimai, n. sp. … *The length of the carapace is almost half as the width. The shape of the carapace is* ***quadrilateral****, the antero-lateral borders broadly rounded, …*

Kato & others (2023): 27. *Merus* ***quadrilateral****, longer than wide, strongly inflated lateral surface with a longitudinal feel around median midline; …*

—**quadrilaterally** (adv.) in a quadrilateral way or manner.

Liu & others (2014): 2. *Genus* HAOOTIA *gen. nov. … Diagnosis (of genus). Soft-bodied,* ***quadrilaterally*** *symmetrical organism possessing a smooth discoidal structure connected by a relatively short stem to a quadrate body comprising numerous regularly aligned linear fibres.*

quadrilobate (adj.). divided, presented, or formed in four distinct lobes, said especially of ostracode valves but also in, e.g. brachiopods.

Goodsir (1845): 378. *Nemertes. …* Gen. Char.—*Anterior extremity of the body rounded, somewhat* ***quadrilobate****, with the proboscidean orifice in the centre.*

Roth (1929): 340. *The valves are roughly trilobate with a faint hint in the male valve of being* ***quadrilobate****, and the broadest and anterior lobe is faintly divided into two lobes as it approaches the hinge line.*

Grant (1976): 64. … *with short, flat, bilobed cardinal process, wide and having small lateral "ears" giving* ***quadrilobate*** *aspect.*

Tillman (1984): 245. *Stictobollia paucifoveata n. sp. …* ***Quadrilobate****, with lobes elongate approximately parallel to valve height.*

Baeza-Carratalá & Garcia Joral (2014): 658. … *valves usually lobate, bilobate, or quadrilobate …*

Jin & Blodgett (2020): 644. *Adductor muscle field* ***quadrilobate****.*

Groos-Uffenorde & others (2022): 697. *Genus* Ctenoloculina *Bassler, 1941 … Remarks. This* ***quadrilobate*** *genus is characterised by a pronounced locular dimorphism.*

quadrinominal (adj.). consisting of four taxonomic terms or names in the final nomenclatural designation, often as the occurrence of a subspecies within a subgenus or an infrasubspecific name (e.g. the ant *Rhytidoponera convexa violacea subumbrata* Crawley, 1922). Such unnecessarily long and burdensome names are not accommodated by the I.C.Z.N. and after original proposal are usually subsequently synonymized into a new combination or combinations.

Packard (1867): 41. *If sub-genera are named, the nomenclature is immediately changed from a* binominal *to a* trinominal *one. If we name the subspecies also it becomes* ***quadrinominal****, and thus science is still further burdened with a long array of useless names.*

R.W. Taylor (1986): 33. *Forty eight* ***quadrinominal*** *infrasubspecific names extracted from the literature of Australian myrmecology are reviewed here.*

Holyoak, Holyoak & Mendes (2019): 115. *The use of subgenera and subspecies for all taxa that have been subdivided was inherent in the CLECOM lists. This sometimes resulted in cumbersome* ***quadrinominal*** *nomenclature …*

quadripennate (adj.). having four wings, feather-like terminations, or other finely four-fold branching features.

Worcester (1849): 580. ***Quadripennate,*** *… Having four wings.*

Syn. **quadripinnate**.

—**quadripennate** (noun). a four-winged organism, typically an insect.

Whitney (1897): 4886. ***quadripennate*** *… II.* n. *A four-winged or quadripennate insect.*

USAGE. This term is historically, and predominantly used in botany to describe the leaves of pteridophytes, since around the 1600s, but is used to describe similar features, e.g. gills, in various invertebrate groups.

quadripinnate. See **quadripennate** (adj.).

Araya & Valdés (2016). 7. Doris fontainii … *Diagnosis: … Notum covered with many small (up to 5 mm in diameter) rounded tubercles. Five to seven tri- to* ***quadripinnate*** *gills.*

quadriplicate (adj.). **1.** with four distinct folds or pleats, especially used in reference to the columella of orthogastropods.

Woods (1875): 139–140. … *aperture narrowed; columella* ***quadriplicate****.*

Melvill & Standen (1912): 355. Mitra (Volutomitra) porcellana*, sp. n. … its narrow aperture, obliquely* ***quadriplicate*** *columella, are distinguishing characteristics.*

Brochwicz-Lewiński (1975): 88. … *the group of* kreuchi-richei *microconchs most probably gave rise to the microconchs of "*Discosphinctes*"* cracoviensis *group. The former are isocostate, with … biplicate ribbing modified on outer whorls into tri- and even* ***quadriplicate****, and are characterized by …*

2. having four anterior folds with three intervening sulci, e.g. as in some ammonoids and brachiopods.

Alexander (1976); 238. *The presence of a few transitional plicate patterns, e.g., … triplicate-****quadriplicate*** *. . .*

Kennedy (1977): 278. … S. cyclodorsata *is said to be rare, small, with rounded whorls and fine, triplicate and* ***quadriplicate****, rursiradiate (apically flexed) ribs …*

Cooper (1983): 76. *Epithyris* Phillips, 1841. … *anterior commissure uniplicate to* ***quadriplicate****.*

MacKinnon & Smirnova (1995): 676. Remarks. — *Evargyrotheca alta … generally* ***quadriplicate*** *shell and highly distinctive microornament.*

quadriradial (adj.). bearing four radiating, pointed terminations; quadriradiate.

A.H. Clark (1910): 355. *It would appear as though the evidence pointed to an original bilateral condition among the adult crinoids in there were two pairs of body processes that had become, through similarity of function, the same; in other words, a bilateral condition which had become as well, through induced radial symmetry due to inactive habit,* ***quadriradial****.*

quadriradiate (adj.). arranged in four rays or arms.

A. Hancock (1849): 346. *In addition to these bodies the surface is provided with triradiate and* ***quadriradiate*** *spicula, the rays, measuring …*

H.J. Carter (1873): 353. *I shall also, for the present, use the terms "sexradiate" for the Hexactinellidæ, and "****quadriradiate****" for the Lithistidæ.*

Lankester (1900): 101. *Three types of spicule occur in calcareous sponges, the entire skeleton being composed of one or more of these types in varying combinations, namely: … (*c*) tetractinal or* ***quadriradiate****, consisting each of four rays.*

Reyes-Montoya & others (2023): 92. *They mostly consist of early growth stages in lateral and discoidal preservation, in the former case usually showing the "pointed" sicula and in the latter case the* ***quadriradiate*** *proximal development.*

—**quadriradiate** (noun). an animal or body part exhibiting a quadriradiate condition, such as a poriferan spicule.

Sollas (1878): 364. *Fig. 21. Edge of a fibre showing an echinating* ***quadriradiate*** *seated close to the surface of the fibre, with one ray projecting outside it …*

Hozawa & Tanita (1941): 428. *The gastral* ***quadriradiates*** *are smaller in number that the triradiates of the same skeleton and their short apical rays are projected into the gastral cavity.*

Elvin & others (2018) 34. *Two very small specimens from BF32 and BF223 have shorter (<200 μm) oxeas, but the triradiates and* ***quadriradiates*** *are also smaller than expected and may represent young colonies of* L. eleanor.

quadriramose (adj.). branching into four, as in, e.g., certain insect antennae.

Shelford (1907): 25. Anaplectoidea Dohertyi*, sp. n. … first anal vein* ***quadriramose****; …*

B.E. Smith (1909): 1095. ***Quadriramose*** *… having four branches, as the antennae of an insect.*

Rehn (1918): 165. *This specimen shows no differences excepting a* ***quadriramose*** *condition of the tegminal discoidal vein, which has one ramus furcate on one tegmen, and biramose on the other.*

quadrisetose (adj.). possessing four setae, typically applied to an insect body part such as a clypeus, and often disposed in two pairs.

Horn (1882): 131. *Phlœoxena Chaud. The characters are very nearly those of* Codoptera. *The ligula is* ***quadrisetose*** *in front, the paraglossæ prolonged and slender at tip.*

Ueno, S. (1960): 141. *… penultimate segment dilated towards apex and asetose in maxillary palpus,* ***quadrisetose*** *in labial palpus.*

Schmidt, Scholz & Maddison (2021): 220. *… an additional character state observed in the fossil specimens which makes it more likely that* Balticeler *represents a member of the Trechitidae: the clypeus is* ***quadrisetose****, with two primary setae on each side.*

quadrisulcate (adj.). marked or patterned by four sulci.

LeConte (1876): 132. *Beak stouter than usual, with the ridges and grooves so strongly marked as to appear tricarinate and* ***quadrisulcate****.*

Hebard (1920): 22. *Head much less transverse than in* Tropidomantis *and* Neomantis*, facial scutellum very strongly transverse, occiput distinctly* ***quadrisulcate****.*

Colonnelli (2005): 244. *… dorsal surface bare, strongly* ***quadrisulcate*** *and thus tricarinate from base up to a short distance beyond antennal insertion, …*

quadrituberculate (adj.). bearing four tubercles, e.g. along a carina in the shells of some ammonoids.

Say (1835): 165. Ptinus, L. *P.* humeralis. *Reddish-brown; thorax* ***quadrituberculate****; elytra with two bands widely interrupted by the suture.*

T. Matsumoto (1984): 341. *With respect to the periodic occurrence of* ***quadrituberculate*** *major ribs, with non-tuberculate ribs on interspaces,* Kawashitaceras *is similar to the above two genera, …*

Gale (2011): 68. Mortoniceras rostratum *is always* ***quadrituberculate*** *on the phragmocone and on the beginning of the body chamber and trituberculate on the terminal part of the body chamber.*

quadrivoltin See **quadrivoltine** (noun).

Butler (1878): 69. B. mori *always produces one brood only, and is therefore called an "annual"; most of the other species produce two, three, four, six, or even eight broods per annum, and in the commercial world are, for that reason, distinguished as 'bivoltins', 'trevoltins', '****quadrivoltins****', etc.*

Riley (1879): 31. **Quadrivoltins**. *Those races which produce four broods in one year.*

quadrivoltine (noun). an organism that produces four broods per year, as in some groups of commercially valuable silkworm.

Bamford (1892): 25. *Among the different varieties are the* Annuals, Bivoltines, Trivoltines, **Quadrivoltines***; producing one, two, three, and four broods each year.*

Abbott (1910): 588. *In concluding, Mr. Tsukai remarks that some successful results have been recently reported in changing a trivoltine race into a* ***quadrivoltine****, presumably by the same method.*

Syn. **quadrivoltin**.

—**quadrivoltine** (adj.). producing four broods annually.

He & others (2010): 283. *As a result of both temporal risk-spreading and adaptive developmental plasticity,* P. demades *produced univoltine, bivoltine, trivoltine and* ***quadrivoltine*** *phenotypes over the season.*

quadrupedal (adj.). four-limbed or, in the case of invertebrates, employing four of the available legs for locomotion. A quadrupedal gait might be behavioural, as seen sometimes in the benthic or terrestrial movement of some octopuses, or necessitated by injury or loss of a limb or limbs, as has been observed in, e.g. brachyurans.

Herreid & Full (1986): 283. *Bilateral leg autotomy alters gait patterns; usually a diagonal* ***quadrupedal*** *gait was adopted. Walking was poor in crabs without chelae …*

How & others (2017): 11. *These species are slow moving and usually found walking with a* ***quadrupedal*** *gait across the sea floor.*

Omura & others (2022): 44. ***Quadrupedal*** *walking with the skin: the ambulatory flaps in "walking" cuttlefish …*

—**quadrupedalism** (noun). the use of four limbs.

Herreid (1981): 2. … *we see leggless [sic] locomotion,* ***quadrupedalism****, hexapedalism, octapedalism and …*

—**quadrupedally** (adv.) in a quadrupedal way.

Pfeiffenberger & Hsieh (2021): 2. *A sister species of the Atlantic ghost crab, the horned ghost crab* (Ocypodeceratophthalmus), *runs* ***quadrupedally*** *on the first and second pairs of limbs at high velocities, …*

qualifying clause (noun). as defined by the PhyloCode, a part of a phylogenetic definition that specifies conditions under which the defined name cannot be applied.

Cantino & Quieroz (2020): xi. … *the definition may contain a* ***qualifying clause*** *specifying conditions under which the name cannot be used.*

quartaxil (sym., IVAx.; pl., IVAxx) (noun). the fifth crinoid ossicle of its series, next after the tertaxil.

Bather (1892): 61. *To say that the* ***quartaxil*** *is the fifth ossicle of its series is obviously the same thing as saying that there are five quartibrachs; while to say that the mainaxil (or tetraxil) is the fourth ossicle of its series is obviously the same thing as saying that there are four tetrastichals.*

Brett (1981): 164. *First axillaries of* ***quartaxil*** *and quintaxil arms both on* αBr_2 *or* αBr_3.

Syn. **quartaxillary**.

quartaxil arm (noun). in crinoids, the fourth axil arm in a series, complete with its own branches.

Bather (1893): 85. *On the exterior of the closed crown there are seen from 4 to 6 main branches, of which one belongs to the primaxil, and one or two apiece to the secundaxil, tertiaxil and* ***quartaxil arms****.*

Ausich, Peter & Ettensohn (2015): 249. ***Quartaxil*** *arm present but not preserved, so branching condition above the second alphabrachial unknown.*

USAGE. This term can commonly be found in hyphenated form (*quartaxil-arm*) in the literature, but the more modern separated form is recommended here, including in all other variations (e.g. *quintaxil arm*, *tertaxil arm*, etc).

quartaxillary. See **quartaxil**.

Donovan & others (2008): 59. ***quartaxillary*** *– the highest quartibrachial (that is, fourth order brachial) of a crinoid arm branching four or more times. The* ***quartaxillary*** *supports two more distal branches.*

Ausich & Donovan (2023): 17. ***quartaxillary***. *See quartaxil.*

quartibrach. See **quartibrachial**.

Goldring (1923): 13. *The brachials of the second order are secundibrachs or distichals, with the axillary plate known as the secundaxil; the brachials of the third order are tertibrachs or palmars. The succeeding orders, formerly known as post-palmars are termed **quartibrachs**, quintibrachs, and so on.*

Goldring (1945): 58. … *which is the continuation of the interradial plates from the level of the secundaxil to the place where the arms of adjacent rays meet, at the first **quartibrach** in the young forms.*

McIntosh (1983): 511. *Arms isotomous from primibrach to, and including, **quartibrach** series.*

Brower (1996): 618. Carabocrinus magnificus *Sardeson … Approximate number of plates: primibrachs 3; secundibrachs 5; tertibrachs and **quartibrachs** not known; quintibrachs through septibrachs 6 or 7; octibrachs not known.*

quartibrachial (sym., 4Br.; IVBr.; Qc.; pl., 4Brr.; IVBrr.) (noun). any ray plate of the fourth brachitaxis in crinoids.

Brower (1992b): 978. *Branched terti- and **quartibrachial** series composed of larger plates than unbranched series or ramules.*

Eckert & Brett (2001): 63. *Inner (adaxial) arms of each quarter-ray narrower than outer arms, dividing on third or fourth tertibrachial, seventh to at least eleventh **quartibrachial**, and ninth quintibrachial.*

Webster & Maples (2008): 148. *The arm bases are commonly broken off at the secundibrachials or radials and the total number of arms per ray where free can only be determined on specimens where the **quartibrachials** are still attached.*

Syn. **quartibrach**.

USAGE. This term is occasionally misspelled in primary literature as *quatribrach(ial)*, e.g. Goldring (1935): 338, 340, 341; Goldring (1938): 110.

quartibrachitaxis (noun). an umbrella term used in the description of crinoids for all brachial plates above the tertaxil, up to and including the quartaxil.

Rhenberg, Ausich & Kammer (2015): 11. *Diagnosis.—Basal circlet low or high; radial circlet high; one fixed secundibrachial; tertibrachitaxis or **quartibrachitaxis** highest brachitaxis in vertical wall of calyx; five …*

Ausich, Rhenberg & Meyer (2018): 690. *Distal-most fixed brachials in tertibrachitaxis or **quartibrachitaxis**. First primibrachial as wide as high, …*

quartinternodal (noun). in crinoids, a fourth-order internodal; an internodal belonging to a fourth-order intercalation.

Moore, Jeffords & Miller (1968): 12. *… large priminternodal (1IN) midway between nodals, two secundinternodals (2IN), four tertinternodals (3IN) and eight **quartinternodals** (4IN) distributed regularly in upper and lower parts of noditaxis, each characterized by progressively diminishing size.*

Webster (1974): 1283. *A nodal is the most prominent columnal which may or may not bear cirri in heteromorphic stems and the internodals are the smaller columnals never bearing cirri between pairs of successive nodals … Internodals may then be recognized on the basis of relative diameter or height as priminternodal, secundinternodal, tertinternodal, **quartinternodal**, etc., with the priminternodal being the largest.*

(symbol). **4I.N.**; **i.N-4**.

—**quartinternodal** (adj.). of an internodal of the fourth order.

quasi-anaerobic (adj.). referring to those organisms within sediments that lack benthic macrofauna but have a restricted resident microfauna living in the presence of minimal oxygen.

Koutsoukos (1989): 399, Table 5.3. … *high degree of oxygen depletion ("**quasi-anaerobic**" conditions, >0-0.1ml/l): varies between virtually no benthonic microfauna and that shown for bottom waters with a moderate degree of oxygen depletion, with increasing numbers of agglutinated specimens.*

Koutsoukos & Hart (1990): 45. … *the record of radiolarian and diatom tests throughout the Cenomanian-Turonian succession is commonly associated with dysaerobic to **quasi-anaerobic** bottom conditions.*

Nützel & Mapes (2001): 143. *The lack or scarcity of infauna and bioturbation as well as the low diversity of the presumed benthos supports an interpretation of a **quasi-anaerobic** to exaerobic benthic environment.*

Schieber & Wilson (2021): 1. *With regard to bottom water oxygenation levels, four categories are commonly considered for modern environments and corresponding biofacies, respectively … namely oxic (8.0–2.0 ml/l O_2) and aerobic, dysoxic (2.0–0.2 ml/l O_2) and dysaerobic, suboxic (0.2–0.0 ml/l O_2) and **quasi-anaerobic**, and anoxic (0.0 ml/l O_2, H_2S) or anaerobic.*

quasimagadiniform (adj.). an obsolete term for the terminal phase in loop development among terebratulide brachiopods, along with *quasipremagadiniform*, which are now ascribed collectively to the cucullate phase.

Popiel-Barczyk & Senkowiczowa (1983): 85. *Four early stages of brachidium development are recognizable in juvenile terebratulids attributable to the species* Angustothyris angustaeformis *(Boeckh) from the Middle Triassic (Lower Muschelkalk) pierced by the Zebrak borehole, Podlasie region, viz.: (1) precentronelliform, (2) centronelliform, (3) close to quasipremagadiniform and (4) close to **quasimagadiniform**.*

quasiparivincular (adj.). **1.** denoting a type of external bivalve ligament that is elongate, opisthodetic, dorsally arched and contains a fibrous sublayer that attaches to both the dorsal and lateral surface of the ligamental ridge (the pseudonymph). This grade of ligament can be further divided into a narrow and a wide type.

Scott & Claggett (2018): 619. *Ligament external, opisthodetic, **quasi-parivincular**, attached to low, rounded pseudonymph om escutcheon …*

J.G. Carter & others (2012): 1. *Externally similar ligaments with the fibrous sublayer attaching well lateral of the associated ligamental ridge (pseudonymph) are herein called **quasiparivincular**.*

2. of shells possessing or characterized by the presence of a quasiparivincular ligament.

J.G. Carter & others (2012): 146. *In certain other **quasiparivincular** taxa, the pseudonymph is more like a dorsally reflected dorsoposterior shell margin, …*

quasiparivincular-narrow (adj.). denoting a quasiparivincular bivalve ligament in which the pseudonymph is represented by the dorsally upturned, dorsoposterior margin. See also Fig. 2.

J.G. Carter & others (2012): 148. ***quasiparivincular-narrow** ligament.*

quasiparivincular-wide (adj.). denoting a bivalve ligament in which the pseudonymph is a low ridge on or near the margin of the wide, flat, more or less horizontal ligamental insertion area, and not just upturned (like in a quasiparivincular-narrow ligament). See also Fig. 3.

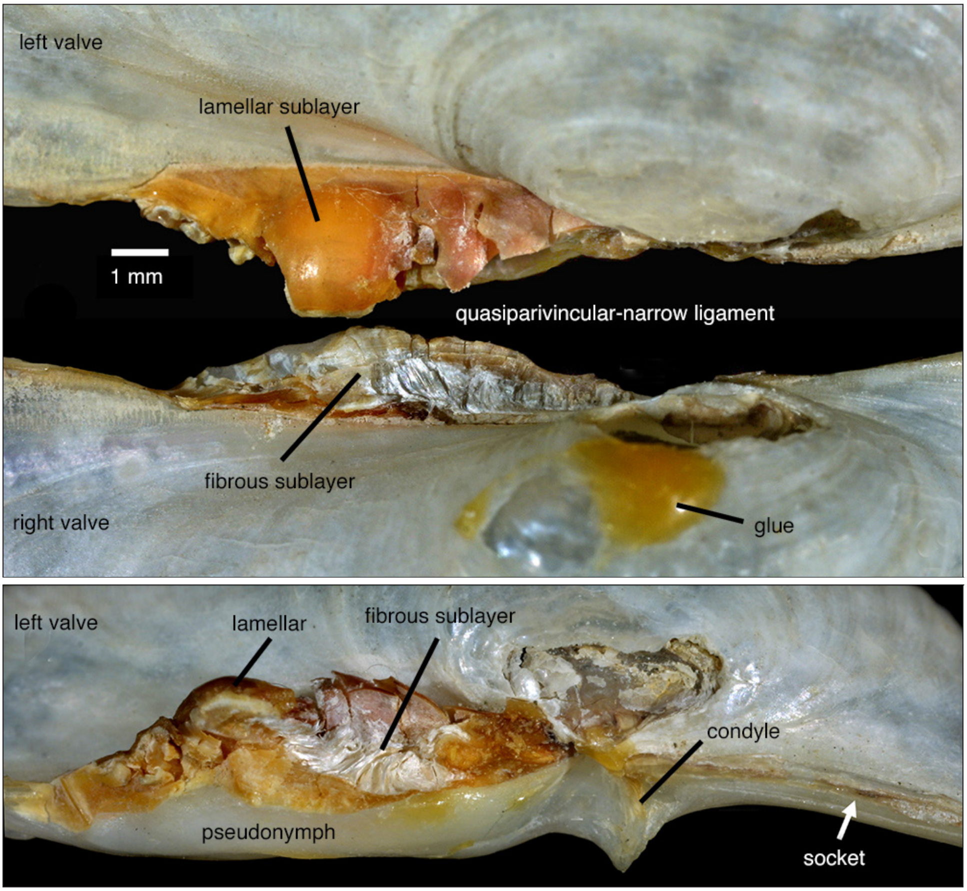

Fig. 2. The pholadomyid *Pholadomya candida* G.B. Sowerby, 1823 in 1821–1834, showing hinge and ligament. 1. Dorsal view of quasiparivincular-narrow ligament; 2. left hinge viewed perpendicular to commissural plane, showing pseudonymph, flanking ligament, a triangular condyle below beak, and anterior, shell marginal socket; scale bar applies to both figures. After J.G. Carter & others (2012: fig. 252).

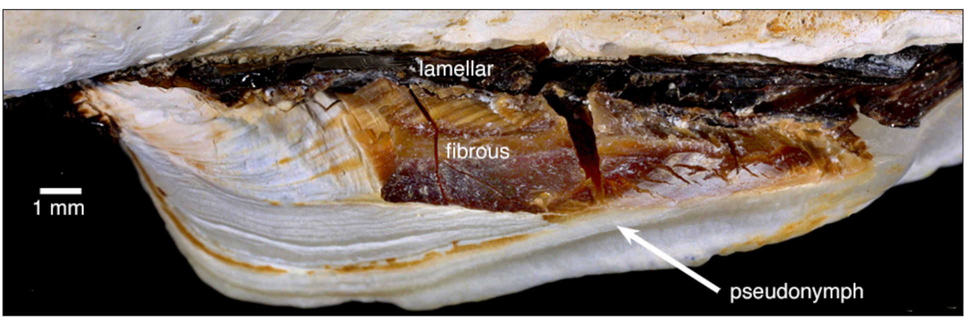

Fig. 3. Quasiparivincular-wide ligament and pseudonymph in hiatellid *Panopea generosa* (Gould, 1850). Dorsal view of ligamental area of left valve, with anterior towards the right. After J.G. Carter & others (2012: fig. 253).

J.G. Carter & others (2012): 148. ***quasiparivincular-wide** ligament.*

quasipremagadiniform (adj.). an obsolete term for the earlier phase in loop development among terebratulide brachiopods, along with *quasimagadiniform*, which are now ascribed collectively to the cucullate phase.

Popiel-Barczyk & Senkowiczowa (1983): 85. *Four early stages of brachidium development are recognizable in juvenile terebratulids attributable to the species* Angustothyris angustaeformis *(Boeckh) from the Middle Triassic (Lower Muschelkalk) pierced by the Zebrak borehole, Podlasie region, viz.: (1) precentronelliform, (2) centronelliform, (3) close to **quasipremagadiniform** and (4) close to quasimagadiniform.*

MacKinnon & Lee (2006): 1975. *Descending lamellae complete in Paleozoic forms, commonly incomplete in post-Paleozoic forms; syn: early crypacanthiform, paramagadiniform, precampagiform, premagadiniform, **quasipremagadiniform**.*

quasisocial (adj.). referring to small groups of female bees that are of similar age, or from the same generation, that cooperate to construct and provide a cell or cells, with more than one bee working in the cell(s).

Gordh & Headrick (2011) 1142. ***QUASISOCIAL** … Small groups of females …*

quasispecies (pl., **quasispecies**) (noun): a population formed from a clone of an asexually reproducing organism. This term has been used in particular in reference to viruses but is applicable into the evolutionary study of a wide range of other groups.

Nowak (1992): 118. *A **quasispecies** is a well-defined distribution of mutants that is generated by a mutation-selection process. Selection does not act on a single mutant but on the **quasispecies** as a whole.*

Biebricher & Eigen (2006): 1. *The **quasispecies** concept has been shown to affect the pathway of evolution and has been studied on RNA viruses which have a particularly high mutation rate.*

—**quasispecific** (adj.). of the nature of a quasispecies.

Quaternary (noun). a period of the international Geologic Time Scale and the most recent, lasting from 2.03 Ma to present and defined by marine microfossils in conjunction with magnetostratigraphy. It incorporates the Pleistocene and Holocene Series in the latest Cenozoic, and its G.S.S.P. is currently assigned to occur at ca. 8m below the observed top of the Olduvai Subchron, contemporaneous with the base of the Pleistocene Series and Gelasian Stage at Monte San Nicola, Italy.

Dawkins (1870): 1. *I propose to … show the relation which the American Mammalia bore to those of Europe, from the Miocene down to the "**Quaternary**," or Post-glacial epoch.*

King & Oakley (1949): 186. *The Commission considers that the Pliocene – Pleistocene (Tertiary – **Quaternary**) boundary can be drawn in accordance with stratigraphical principles.*

Gibbard & Head (2010): 152. *In June 2009, the Executive Committee of the International Union of Geological Sciences (IUGS) ratified a proposal submitted by the International Commission on Stratigraphy (ICS) to define the base of the **Quaternary** System by the Global Stratotype Section and Point (GSSP) of the Gelasian Stage at Monte San Nicola in Sicily, Italy, currently dated at 2.58 Ma … The base of the Pleistocene Series was simultaneously redefined (lowered) so as to be coterminous with that of the **Quaternary**.*

—**Quaternary** (adj.). of the Quaternary Period, or its associated deposits.

Humble (1860): 377. *The faluns, or marls of Tourraine and Loire, are* **quaternary** *formations.*

West (1956): *The geology and palaeobotany of* ***Quaternary*** *deposits at Hoxne, Suffolk, have been investigated. … A comparison of these* ***Quaternary*** *deposits is made with those elsewhere in Britain, in Ireland and on the continent.*

Coope (1970): 101. *Curiously, in the light of their abundance as fossils in deposits of earlier geological eras, both the Orthoptera and Odonata are rare as* ***Quaternary*** *fossils.*

Aguirre & others (2011): 277. *Estimations of* ***Quaternary*** *marine palaeobiodiversity and palaeobiogeography represent one of the tasks for a better understanding of the effects of the last climatic cycles on oceanic life.*

quaternate (adj.). composed of, or forming, a set of four; arranged in four parts.

H.J. Carter (1871): 119. *The figures 37–39 and 72–74 inclusively all appertain to a quadrifid or* ***quaternate*** *system, which, whether belonging to the Coralliospongiæ or to the Pachytraginæ, only find their parallel now, …*

queen (noun). the sole fertile and therefore young-producing individual in colonial insects, such as ants, bees, termites and wasps. A colony will produce a queen by feeding one particular female larva with partially digested food called royal jelly, and once developed the queen's only real function is to feed and produce young, typically growing to a great size compared to all other members of the colony.

Chambers (1753): Vol. II. ***Queen****-bee, a term given by later writers to what used to be called the king-bee, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every swarm, and which is always treated with the greatest respect by the rest.*

Debraw (1777): 18–19. *… the* ***queen*** *is the only female in the hive, and the mother of the next generation; …*

J.A. Thomson (1933): 269. *The* ***queen*** *begins to be maternal, and, as she can lay three thousand eggs in a day, the population of the hive increases rapidly and the workers have nursing as well as foraging duties.*

—**queenright** (adj.). pertaining to a colony (of ants, bees, etc.) that includes a functioning queen.

Gordh & Headrick (2011) 1143. ***QUEENRIGHT*** *… Peraining to a colony with a functional queen.*

Quenstedt (muscle) scar (abbrev. Q.; q; Q.M.). a small, circular attachment scar in bivalves reflecting a muscle that is generally located between the posterior adductor muscle and umbonal cavity. The Quenstedt muscle probably serves as an anterior ctenidial elevator or protractor, and sometimes does not attach in life, thus forming no scar.

Stenzel (1963): 232. *Adult oyster shells are composed mainly of calcite, but there are five small areas of aragonite: the resilium, the two pads at which the adductor muscle is inserted, and the two pads at which* ***Quenstedt's muscles*** *are inserted.*

Stenzel (1971): 957. *In fossil oysters, one can locate the mouth-anus axis approximately. The mouth is near the imprint of the* ***Quenstedt muscle*** *…*

Pugaczewska (1975): 61. *A small "****Quenstedt muscle scar****" is visible in the middle, subumbonal part. It is semilunar in outline, with a straight and somewhat depressed dorsal and convex ventral margin. Its transverse diameter amounts to about 0.5 mm.*

quiescence (noun). a temporary slowing down of metabolism, seen in some insects in response to any of a range of external environmental factors. These include a shift to unfavourable temperature, humidity, nutrient availability, disease or hormone imbalance. In such enforced dormant periods, the animal can survive with minimal movement and food intake for long periods. The term has historically been used more or less as a synonym of *diapause*, but most authors nowadays recognize a distinction between the two, in that both inhibit hatching in the larval phase, but only diapause also drives dormancy in the imago.

Fink (1925): 390. *After feeding on foliage of the potato plant for ten days, the weight averaged 0.2627 grams. A state of **quiescence** or* prehibernation *followed, …*

Brendonck (1996): 85. *Diapause is taken to mean 'the state of dormancy where an arrest of development is initiated by internal factors'. **Quiescence** refers to 'a hypo-metabolic state imposed by unfavourable external conditions'.*

Hodek (1996): 475. *Terms diapause and **quiescence** are used in the usual way, dormancy as a general term for both types of arrest.*

Diniz & others (2017): 1. *… on the definitions and terminology of dormancy in insects, dormancy is divided into two major categories: diapause and **quiescence**.*

—**quiescent** (adj.). displaying behavior that is characterized by periods of quiescence.

Lubbock (1873): 108. *… undoubtedly the **quiescent** and deathlike condition of the pupa is one of the most remarkable characteristics of insect metamorphoses.*

Way, Hopkins & Smith (1949): 615. *This has necessitated a study of the factors affecting diapause, the **quiescent** phase in which most plant-feeding insect species spend late autumn, winter and early spring.*

Easwaran & Montell (2023): 1851. *… under optimal temperature, hydration, and nutrient availability, metabolism ramps up to promote growth and reproduction whereas when conditions are less favorable, organisms enter **quiescent** states and yet are poised to reactivate development if and when conditions improve.*

—**quiescently** (adv.) in a quiescent manner.

Womersley (1993): 87. *The degree to which they are able to persist **quiescently** or to what level they can lower their metabolic rate, and whether they are able to become cryptobiotic would appear to be dependent on the levels of stress to which they have adapted within the confines of their own ecological niche.*

Dolezal & others (2019): 31. *Organisms are usually equipped with an array of pre-existing, innately present immune mechanisms, ready to take immediate action. These mechanisms **quiescently** await activation by the pathogen, using no more energy than is needed for their basal functioning.*

quiet (adj.). a mostly archaic term describing a specimen that is not marked by any conspicuous markings or other features.

Gordh & Headrick (2011) 1144. ***QUIET** … Not conspicuous or contrasting in colour or maculation.*

quietichnion noun (pl., **quietichnia**): an obsolete term proposed by Müller (1962, his Ruhespuren) for a category of trace fossils including cubichnia and some domichnia, reflecting temporarily immobile behavior.

Müller (1962): 25. *Wie aus Bild 21 ersichtlich, lassen sich dabei folgende Gruppen und Untergruppen unterscheiden: 1. Ruhespuren (**Quietichnia**) a) Liegespuren (Cubichnia) b) Wohnbauten (Domichnia) 2. Freßspuren …*

Müller (1962): 26. *1. Ruhespuren (**Quietichnia**): Als Ruhespuren werden hier alle Lebensspuren zusammengefaßt, die einmal durch Aufliegen oder flaches Enwühlen freibeweglicher Tiere, zum anderen durch den Bau stationärer, unbeweglicher Wohnbauten entstehen.*

Rhodes & others (1966): 16. ***Quietichnia**: Resting trails, including Cubichnia Seilacher and Domichnia Seilacher.*

Häntzschel (1975): 22. *Müller … expanded Seilacher's classification … and distinguished four main groups: **Quietichnia** (resting traces), …*

Vallon, Rindsberg & Bromley (2016): 8. Müller (1962) proposed several groups of higher and lower ranked trace fossils to augment Seilacher's (1953a) scheme. For example, his supercategory ***'quietichnia'*** (from Latin quiēscere, to rest) comprised Seilacher's cubichnia and domichnia. However, this early advance was largely ignored by Western scientists.

—**quietichnial** (adj.). of or resembling quietichnia.

USAGE. See: **-ichnion**.

quincunx (noun). a pattern of five points arranged in a cross, with four points having a squarish to rectangular disposition, and a fifth located more or less centrally among them, as seen in the ornament or group of other external features in, e.g. some brachiopods, corals and molluscs.

W. King (1850): 34. *… a row of foramina or chambers between the parallelly-disposed cells, or a small shallow cavity over the mouth in species with cells in **quincunx**.*

Davidson (1886–88): 91. *The surface of the shell, when examined by the aid of a lens, is tessellated with elongated dots arranged in a **quincunx**, which seems to the specks of opaque white colour rather than punctures.*

Rowell (1971): 75. *… in some species, the pits are arranged in **quincunx** …*

MacKinnon & Smirnova (1995): 676. *Surface microornament consisting of a dense array of roughly triangular-shaped granules arranged in **quincunx** …*

USAGE. Whilst functioning exclusively as a noun, this term more often than not occurs in the phrasal form *in quincunx* (see quots.).

quinquannulate (adj.). characterized by or disposed in five ring-like segments, as of e.g. the bodies of some hirudineans.

Oceguera-Figueroa (2006): 200. *Somites I, II, III, IV uniannulate, somite V and VI biannulate, somite VII triannulate, VIII quadriannulate, somites of middle series, IX-XXIII, complete **quinquannulate**, XXIV and XXV quadriannulate, XVI triannulate and XXVII biannulate.*

McVean, Gascoigne & Page (1990): 166. *All **quinquannulate** segments are initially uniannulate on which the sensilla appear as transverse bands.*

Takafumi (2022): 141. Orobdella ibukifukuyamai *can be distinguished from the four sexannulate species, i.e., … and by its somite VII that is **quinquannulate** (quadrannulate in …).*

quinquecapsular (adj.). describing a structure containing five capsules, and used primarily in botany but occasionally in the taxonomic description of such features in some insects.

Lee (1799): 27. *In respect to external division, the pericarpium is either* absent, *as in the order Gymnospermia of the Class Didynamia;* unicapsular, *consisting of one capsule, as in Lychnis;* bicapsular, *of two, as in Pæonia and Asclepias;* triscapsular, *of three, as in Veratrum and Delphinitum;* quadricapsular, *of four, as in Rhodalia;* **quinquecapsular**, *of five, as in Aquilegia;*

or multicapsular*, of many, as in Caltha, Trollius and Helleborus.*

quinquecostate (adj.). bearing or sculptured by five radial ribs, e.g. in some brachiopods.

J.T. Clark (1978): 250. … *the external and middle zones of the capsule wall is spongy and extended into five longitudinal ribs (**quinquecostate**), one ventral, two ventrolateral and two dorsolateral, the two latter being the most widely spaced.*

Nikitin & Popov (1996): 9. Etymology. *After the **quinquecostate** radial ornamentation.*

quinquedentate (adj.). possessing five teeth or tooth-like protuberances.

Pate (1938): 168. *Pygidium **quinquedentate**, the inner lateral tooth spinoid and the longest.*

Buckeridge (1997): 138. *Diagnosis. — A large* Metaverruca *with … mandible **quinquedentate**; …*

quinquefid (adj.). arranged or split into five distinct parts; quinquepartite.

Butler (1878): 481. Neptis cyanifera*, n. sp. … secondaries crossed before the middle by an irregular **quinquefid** white stripe enclosed in a rather broad blue belt; …*

Meregalli (2009): 316. … *scale on underside of head bifid ('the scaly hairs on the genae are **quinquefid**'); …*

quinquelobate (adj.). having five lobes, a common botanical term but also widely use in the descriptions of animals with pentameral symmetry, e.g. crinoids, and in describing other features such as ammonoid sutures.

McChesney (1869): 23. Glytpocrinus? armosus … *The arm bases are heavy and stand upon five double lobes, giving the fossil a somewhat **quinquelobate** appearance.*

H. Matsumoto (1929): 31. *Family 1. Isocrinidae … Columnals, or at least those of the upper portion of stalk, pentagonal or **quinquelobate**.*

Wiedmann & others (1990): 375. *The suture line is characterized by a **quinquelobate** primary suture.*

quinquepartite (adj.). split into or composed of five parts.

Bather (1913): 6. *The stem is **quinquepartite** throughout, with radial sutures.*

quinqueradial. See **quinqueradiate**.

Bell (1892): 12. … *bilateral symmetry is early or altogether lost, but may be secondarily acquired; it is generally replaced by a **quinqueradial** disposition of nearly all the parts.*

Smith (1909): 1100. ***quinqueradial** … having five rays, as some echinoderms; …*

Jefferies (2007): 110. … *the ambulacra were biradial, not uniradial as in solutes, and there are signs of vestigial biradiality (and of vestigial triradiality) in the imperfectly **quinqueradial** ambulacral system of primitive five-rayed echinoderms; …*

—quinqueradially (adv.) with a quinqueradial disposition or tendency.

Bell (1891): 207. *The genital apparatus is not disposed **quinqueradially**; in all other Echinoderms the gonads are either arranged along the rays or, when they fuse, in the interradii …*

quinqueradiate (adj.). having or consisting of five rays, as in some echinoderms and poriferans.

W. Thomson (1869): 704. *The smaller **quinqueradiate** spicules … resemble the larger in general form; they are, however, much more delicate and flexible, and even more desultory in the distribution of their branches.*

Springer (1926): 2. *The plates of which the calyx is composed are arranged usually according to a* ***quinqueradiate*** *plan, most plainly developed on the lower side to which the stem is attached, from which the radiation extends upward and continues into the arms.*

Łuczkowska (1974): 33. *Thus, she arrives at the conclusion that the triloculine forms that have a "****quinqueradiate****" internal structure (later termed "cryptoquinqueloculine" …, should be included in the genus* Quinqueloculina.

Syn. **pentameral**; **pentamerous**; **quinqueradial**.

quintaxil (sym., Vax; pl., VAxx.) (noun). the sixth crinoid ossicle of its series, next after the quartaxil.

Goldring (1945): 59. *In the youngest specimen adjacent arms appear to meet at the first quartibrach, in the mature specimens at the* ***quintaxil****.*

Syn. **quintaxillary**.

quintaxil arm (noun). in crinoids, a fifth axil arm.

Kesling & Gisler (1969): 341. *Primaxil-arm first axillary on* αBr_4*; secundaxil-arm and tertaxil-arm first on* αBr_3*; and quartaxil-arm and* ***quintaxil****-arm first on* αBr_2*.*

Brett (1981): 164. *First axillaries of quartaxil and* ***quintaxil*** *arms both on* αBr_2 *or* αBr_3*.*

USAGE. This term can commonly be found in hyphenated form (*quintaxil-arm*) in the literature, but the more modern separated form is recommended here, including in all other variations (e.g. *quartaxil arm*, *tertaxil arm*, etc).

quintaxillary. See **quintaxil**.

quintibrach. See **quintibrachial**.

Goldring (1923): 13. *The brachials of the second order are secundibrachs or distichals, with the axillary plate known as the secundaxil; the brachials of the third order are tertibrachs or palmars. The succeeding orders, formerly known as post-palmars are termed quartibrachs,* ***quintibrachs****, and so on.*

Brower (1992a): 117. *The most distal brachials,* ***quintibrachs*** *and hexibrachs, appear at the distal arm tips late during ontogeny.*

Brower (2002): 118. *The numbers of quartibrachs and* ***quintibrachs*** *are randomly distributed compared to the proximal primibrachs and secundibrachs, where none of the correlation coefficients are significant.*

quintibrachial (noun). in crinoids, a brachial of the fifth order.

R.C. Moore & Laudon (1941): 417. *Symbols for brachials above the fourth order are little used, but if there is occasion for them, Roman (or Arabic) numerals are best in order to avoid duplication of initial letters: VBr (or 5BR) for* ***quintibrachial****, VIBr (or 6Br) for sextibrachial, etc.*

Eckert & Brett (2001): 63. *Inner (adaxial) arms of each quarter-ray narrower than outer arms, dividing on third or fourth tertibrachial, seventh to at least eleventh quartibrachial, and ninth* ***quintibrachial****.*

(symbol). **5Br.** (singular); **5Brr.** (plural); **VBr.** (singular); **VBrr.** (plural).

Syn. **quintibrach**.

quirotype See **chirotype**.

Frizzell (1933): 663. *187. ****Quirotype*** *(= chirotype).*

Evenhuis (2008): 19. **Quirotype** … *See Chirotype.*

Hawksworth (2010): 165. ***quirotype****:* see *chirotype.*

—quirotypic(al) (adj.). of a quirotype.

USAGE. See **-type**.

Qungzusian (noun). a Chinese stage of the middle Early Cambrian (532–523 Ma), locally next below the Changlangpuan and above the Meishuchuan stages.

Felitsyn & Bogomolov (2020): 2085. *Similar values for the Earliest Cambrian (former Tommotian and Atdabanian = Meishuchuan and **Qungzusian**) phosphate nodules from Upper Silesia and eastern Poland have been published earlier.*

—**Qungzusian** (adj.). designating, of the age of or found in rocks of the Qungzusian Stage.

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ABOUT THE AUTHORS

Kristian P. Saether received his B.Sc. in Environmental Geology in 2005 from the School of Earth and Environment at the University of Leeds (United Kingdom). Having shown a particular proficiency for Paleontology and academic writing during his undergraduate studies, he was invited to commence a Ph.D. at the University of Auckland (New Zealand), bypassing the M.Sc. intermediate stage, and graduated there in 2011.

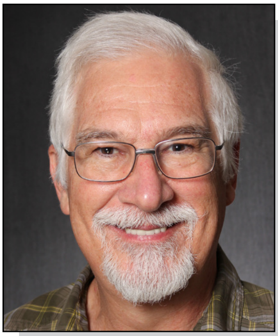
Dr. Saether has extensive editorial experience as an Associate Editor for *Acta Geologica Sinica* since 2015, in a wide range of geological disciplines. He has lectured in Geobiology at the University of Hull (United Kingdom), and in Invertebrate Paleontology and Evolution at the Nanjing Institute of Geology and Palaeontology (or NIGPAS, China), in his first Postdoctoral Researcher position, in 2014.

His research has mainly focused on the paleobiogeography, paleoecology, and taxonomy of invertebrates, with particular emphasis on those associated with the hydrocarbon seep 'extremophile' environment. As a keen lexicographer, his first published glossary was about fossil hydrocarbon seeps, in 2022.

Sandra J. Carlson received her B.S. in Earth Science at the University of California Santa Cruz in 1978. After working at the U.S. Geological Survey as a micropaleontology technician for a year, she was accepted to the graduate program in geological sciences, focusing on paleontology, at the University of Michigan, where she completed an M.S. (1982) on extinct echinoderm functional morphology and Ph.D. (1986) on fossil brachiopod functional morphology and evolution.

Dr. Carlson is a University of California, Davis Professor Emerita, retiring in 2022 after 36 years in the Department of Earth and Planetary Sciences. Dr. Carlson was elected to the 2005 class of Centennial Fellows of the Paleontological Society, and later served in leadership roles with the Paleontological Society, elected to that society's six-year cycle as President Elect, President, and Past President. She received the Association for Women Geoscientists Encourage Award in 2016 and the Gilbert Harris Award from the Paleontological Research Institution in 2019. She has been active in STEM K-16 teaching initiatives, including outreach efforts to broaden participation in the earth sciences, serving as Director of the UC Davis CalTeach/Mathematics and Science Teaching program (2014-2022). For the past three years, she has served as a Member-At-Large on the American Geosciences Institute Board of Directors.

Her continuing research is focused mainly on brachiopod systematics, phylogenetics, and evolutionary history, and extends also to molluscan shell growth and microstructure, as well as fossil vertebrate dental morphology and physiological inference.



Andrew K. Rindsberg studied ichnology as a graduate student under Robert W. Frey at the University of Georgia (1983) and John E. Warme at the Colorado School of Mines (1986). He spent the first half of his postgraduate career largely as a research geologist with the Geological Survey of Alabama. Since 2006 he has taught at the University of West Alabama, writing papers with an emphasis on invertebrate ichnotaxonomy, and revising part W (Trace Fossils) of the *Treatise on Invertebrate Paleontology* together with Dirk Knaust. Lothar H. Vallon is a frequent collaborator.

Lothar H. Vallon, Diplom-Geologe (Master of Science in Geology), graduated from the University of Stuttgart (Germany) in 2003. He works as a mudlogging geologist off Norway and is a freelance researcher at Kalk, the geoscientific branch of the Museums of East Zealand of Denmark. His main research interests lie in sedimentary paleoecology, especially ichnology. Here he focuses on ethology and ichnotaxonomy. He has been the section editor of ichnology for Pal.Z. since 2023.