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*CONOCARDIUM LANGENHEIMI* SP. N.  
(MOLLUSCA: BIVALVIA) IN THE LOWER PERMIAN SERIES  
OF THE McCLOUD LIMESTONE, NORTHERN CALIFORNIA

By EDWARD C. WILSON

LOS ANGELES COUNTY MUSEUM OF NATURAL HISTORY • EXPOSITION PARK  
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*CONOCARDIUM LANGENHEIMI* SP. N.  
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By EDWARD C. WILSON<sup>1</sup>

ABSTRACT: *Conocardium langenheimi* sp. n. (Mollusca: Bivalvia) occurs in the Wolfcampian Stage, Lower Permian Series of the McCloud Limestone in Shasta County, California. It is a large shell with a non-carinate posterior end, three pairs of perforate "shelves" within the gaping anterior end, a tube enclosed dorsally in the shell layers of each valve, unique internal hinge structures, and microstructure unlike most other bivalves. The functions of these and other characters is unknown. The entire Order Conocardidoida needs investigation to determine the significance of such characters, especially for placing the group in higher categories of classification.

INTRODUCTION

At the suggestion of R. L. Langenheim, Jr., Professor of Geology at the University of Illinois, I began a study of the paleontology of the McCloud Limestone in Shasta County, California, in the spring of 1963. Two previous papers (Wilson, 1967a, 1967b) resulted from this study and this paper is another contribution.

ACKNOWLEDGMENTS

I am grateful for opinions on the morphology and systematic position of the Conocardidoida from J. Wyatt Durham of the University of California at Berkeley, John Pojeta, Jr. of the U.S. National Museum, and Norman D. Newell of the American Museum of Natural History. Professor Durham kindly visited the type localities with me. Most of the photographs are by Lawrence S. Reynolds of the Los Angeles County Museum of Natural History.

Field work in 1963 and 1964 was financed in part by the University of California Museum of Paleontology (UCMP) and the University of California Committee on Research, both at Berkeley. The Los Angeles County Museum of Natural History (LACM) provided funds for further field work in 1968.

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## SYSTEMATIC DESCRIPTION

Phylum MOLLUSCA

Class BIVALVIA Linnaeus, 1758

Order CONOCARDIDOIDA Neumayr, 1891

Family CONOCARDIIDAE Miller, 1889

Genus *Conocardium* Bronn, 1834

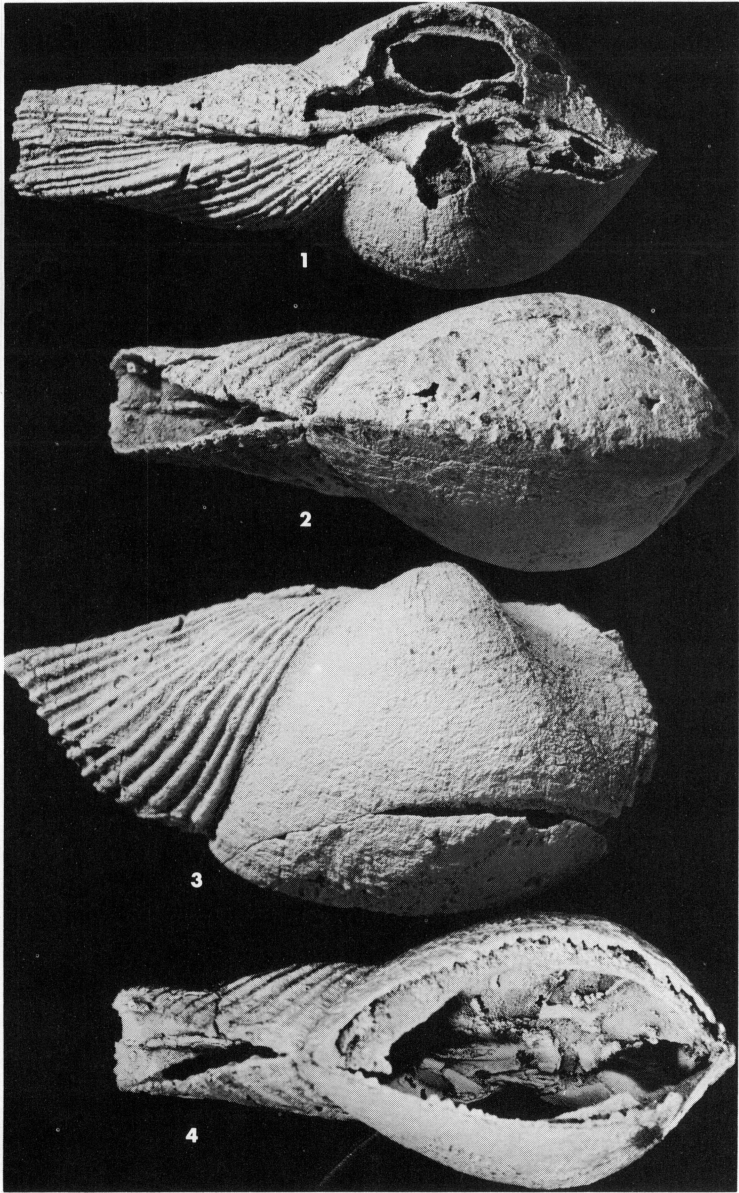
*Remarks:* Terminology has not been standardized for the unique characters of the Conocardidoidea. I have used where possible the terminology for other bivalve mollusks, although this is partially unsatisfactory. The structures called "auricles" are probably not homologous with the auricles of other bivalves. The "shelves" in the gaping anterior "auricle" are without parallel in the rest of the Bivalvia. The openings in the "shelves" and the tubes enclosed in the shells have no formal names. The kind of "teeth" on the ventral and posterior edges should probably be named. It is not even possible to use uniformitarianism to orient the shell with certainty. It may seem reasonable that dorsal and ventral are accurately delineated, but there is no such certainty about anterior and posterior. The figures and legends indicate usage of morphological terms in this paper.

*Conocardium langenheimi*, sp. n.

Fig. 1

*Description (external):* Valves equivalve, inequilateral, opisthogyrate, alate (?), not ankylosed; main body of valves inflated, rounded (not carinate posteriorly); posterior "auricle" small, sloping smoothly into main body of valves, not gaping; anterior "auricle" separated by constriction from main body of valves, large, rostrate, gaping anteriorly and ventrally, with large trigonal aperture having scalloped margins; hinge line straight, except anterior part of anterior "auricle" may dip to 25° (preservation?), occupied by groove, shallow in anterior part of anterior "auricle," deep in posterior part of anterior "auricle" and main body of shell; commissure straight on exterior of ventral parts of shells; holotype shell length 6.5 cm, height 4.3 cm, width 2.9 cm (largest specimen, LACM paratype 2443, is 4 mm. higher, but incomplete

Figures 1-4. *Conocardium langenheimi* sp. n. UCMP holotype 10589, UCMP locality D-831, all figures X 1.3; (1) dorsal view, anterior "auricle" at left, posterior "auricle" at right, main body of shell inflated, openings in umbos caused by post-burial weathering, double wall caused by dissolution in HC1 of calcareous layer between silicified layers, note absence of posterior carina; (2) ventral view, showing straight exterior commissure of main body, gape of anterior auricle, internal ridge at hinge line; (3) lateral view of left valve, sculpture on main body possibly dissolved in part during etching; (4) ventral view, with piece of shell removed to show dorsal interior, dorsal ridge along hinge line of main body broken with fragments lying in right valve, note trigonal cross sections of ridges remaining in shell wall after etching.



in other dimensions); sculpture concentric or cancellate (?) on main body of valves, with about 4 evenly spaced concentric riblets in one mm., with possible traces of radial riblets; sculpture radial on "auricles" (UCMP paratype 10590, juvenile, shows some concentric), about 17 ribs on anterior "auricle" of each holotype valve, fewer on posterior "auricle" (UCMP paratype 10590, juvenile, has 9 ribs on each posterior "auricle"); ribs straight to very gently sigmoid, sloping down from hinge line at angles varying from 65° on posterior part of anterior "auricle" to 25° on anterior part, flat topped with straight to rounded sides sloping down and out at less than 45°; rib interspaces about equal to rib widths, lirate, with about 20 dorsally convex lirae in 1 mm, rarely occupied by single riblet.

*Description (internal)*: Main body of valves smooth; pallial line, muscle scars not observed; ventral and posterior commissure zig-zag, formed by series of trigonal "teeth" and intervening sockets in each valve, 3 occurring every 5 mm each side of both valves (holotype), sockets showing plainly only in section ("teeth" are surficial extensions of radial rods, trigonal in cross section, apex pointing inward, that dorsally form part of the internal shell layer); hinge line a complex ridge, low in anterior end, becoming higher posteriorly, developing horizontal distal bar (inverted T-shaped in cross section) within main body cavity of valves, where narrow trough borders each side (marking lateral limits of apparent separate hinge plate in this area), becoming lower and broader posteriorly, troughs continuing alongside into posterior "auricle," where termination not observed because of preservation; 3 pairs of complex "shelves" lining lateral interior of anterior "auricle," sloping in and up same angles as exterior ribs, each pair meeting in midline, dividing "auricle" roughly horizontally into 4 unequal areas; dorsal pair of shelves beginning about 15 mm back of "auricle" anterior edge, about 8 mm below top of "auricle," forming large heart shaped opening in cross section above "shelves," turned up along midline by lip-like ridge, sloping upward, separating along midline below

Figures 5-9. *Conocardium langenheimi* sp. n. (5) holotype, anterior view into gaping "auricle" showing 3 pairs of "shelves," X 1.3; (6) same specimen, posterior view, umbos partially weathered away, note zig-zag commissure of "auricle," straight commissure of main body, X 1.3; (7) same specimen, same view as figure 5 with part of auricle removed, missing parts of wall dissolved during etching, note exterior groove and interior ridge of hinge line with grooves bordering latter, dorsal "shelves" meeting along midline with opening into main body visible just above, middle shelves similar but extending anteriorly to form keyhole shaped opening, partly obscured small ventral "shelves" shaped like middle "shelves," X 3.6; (8) LACMNH paratype 2443, LACMNH locality 1133, fragment showing zig-zag interior ventral commissure formed of series of teeth and sockets, note left valve showing original smooth interior, right valve showing etched layer of shell wall with internal trigonal ridges which terminate ventrally as teeth, X 0.6; (9) UCMP paratype 10590, UCMP locality D-831, lateral view of right valve of juvenile specimen, note concentric sculpture on main body and anterior auricle, offset posterior "auricle," outline of anterior "auricle" varying from figure 3, X 1.4.